HA
29
.U6

DEPARTMENT OF THE ARMY PAMPHLET 325-10

Standards of STATISTICAL PRESENTATION

HEADQUARTERS, DEPARTMENT OF THE ARMY APRIL 1966

WITHDRAWN
HA
29
.U6

PREFACE

This pamphlet establishes standards and provides guidance for the presentation of statistical material in the Department of the Army. It supersedes the manual, STANDARDS OF PRESENTATION, published by Headquarters, Army Service Forces, in May 1946, which was issued as a guide to all major commands by the Chief of the Program Review and Analysis Division, Office of the Comptroller of the Army, in a memorandum dated 21 April 1950, and it also supersedes the Graphic Presentation chapter, Standards of Statistical Presentation, March, 1955, prepared by the Office of the Comptroller of the Army.

Purpose and Scope of Pamphlet

The pamphlet is primarily concerned with statistical presentation for published and typewritten reports, but it also discusses problems peculiar to oral statistical presentations. It covers planning, design, production, and format, with major emphasis on design and production. The list of references includes some textbooks that cover the analysis of statistical data as well as the presentation of statistics.

It is designed to serve as instructional material for persons not experienced in planning and preparing statistical reports and presentations and as a reference handbook for those who have had such experience. It contains suggestions for typists and draftsmen as well as for statistical analysts.

The publication includes information on how to design and construct tables and charts and how to use text in statistical reports. In addition, it contains chapters on production techniques, page and report format, and the preparation of displays for oral presentation.

The chapter on charts contains many examples of chart types and comments on appropriate uses of the various types. The standards prescribed are in general agreement with those set forth in AMERICAN STANDARDS: TIME SERIES CHARTS, a manual of Design and Construction, published by the American Society of Mechanical Engineers, New York, New York.

Application of Standards

The standards in this manual are designed primarily for use in formal published reports, but they are equally effective for informal or special reports throughout the Department of the Army.

Sometimes it is not practical to follow the prescribed standards in all respects. The unexpected "rush" report must often be produced with whatever skills and facilities are available, in the time allowed. Established reports may also present such a variety of problems that complete uniformity of treatment is not always possible.

The standards established in this manual should be regarded as flexible enough to permit exceptional treatment in exceptional cases. Many apparently exceptional reports, however, are not as unusual as they may seem: they can often be made to conform with the established standards by careful consideration of alternative presentation techniques.

When the standards cannot be carried out to the letter, the principles behind them should be followed as closely as possible.

PAMPHLET

NO. 325-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 4 April 1966

STANDARDS OF STATISTICAL PRESENTATION

		Page
Chapter 1.	PRESENTATION	1
	Qualities of Good Presentation	1
	Major Problems in Presentation	2
	Major Procedures in Presenting Data	2
	The Three Forms of Presentation	4
2.	TEXT PRESENTATION	5
	How to Write Text	5
	Numbers in Text	6
	Arrangement of Text	7
	Chapter Headings	7
	Justifying	9
3.	TABULAR PRESENTATION	11
	Basic Principles	11
	Tabular Forms	12
	Arranging Figures for Emphasis	12
	Common Faults in Statistical Tables	13
	Basic Tabular Arrangements	13
	Position on Page	13
	Terms Used in Tabular Presentation	14
	Pages Required	15
	Internal Structure	15
	Component Parts of a Table	19
	The Title	20
	The Stub	22
	The Boxhead	28
	The Field	31
	Tabular Notes	34
	Tabular Rulings	38
	Where to Put Rulings	38
	Weight of Rulings	38
	Blue Pencil Rulings	38
	Other Ruling Considerations	38
	Space Requirements	39
	Table Width and Length	39
	Unusual Spacing Problems	40
	Handling Extreme Cases	40
	Preprinted Tabular Forms	42
4.	GRAPHIC PRESENTATION	44
	General	44
	Chart Components	45
	Chart Types	46
	Curve Charts	46
	Surface Charts	50
	Column Charts	52
	Bar Charts	54
	Combination Types	58
	Frequency Charts	60
	Graphic Tables	61
	Graphic Types Not Recommended	62
	Pie Charts	62
	Area Charts	62
	Three-dimensional Charts	63
	Perspective Charts	63
	Perspective Plus 3-dimensional Treatment	64
	Pictographs	64
	Maps	64
	Typical Examples of Poor Presentation	65
	Planning and Designing Charts	66
	Development of Charts from Tabular Data	67
	Chart Sketches	70
	Data Sheets for Charts	70

Chapter 4. GRAPHIC PRESENTATION - Continued Page
Planning and Designing Charts - Continued
Designing Bar Charts 71
Insert Charts 72
Subdivided Surface Charts 73
Status-Change-Status Charts 74
Changes in Content of Data 74
Logarithmic Charts 75
Chart Style 76
Chart Construction 78
Grid Proportions 78
Chart Size 79
Scales 80
Scale Rulings 84
Time-Scale Designations and Rulings 86
Selecting Scales for Bar Charts 88
Breaking Bars and Columns 89
Spacing Bars (or Columns) 90
Connected Columns 91
Overlapping Columns (or Bars) 91
Goals and Projections 92
Shading 94
Selecting Curve Patterns 97
Preprinted Parts in Chart Construction 98
Chart Captions 99
Labels 100
Arrows and Other Label Pointers 101
Chart Lettering 102
Line Weight Standards and Lettering Pens 104
Chart Specification Sheets 105

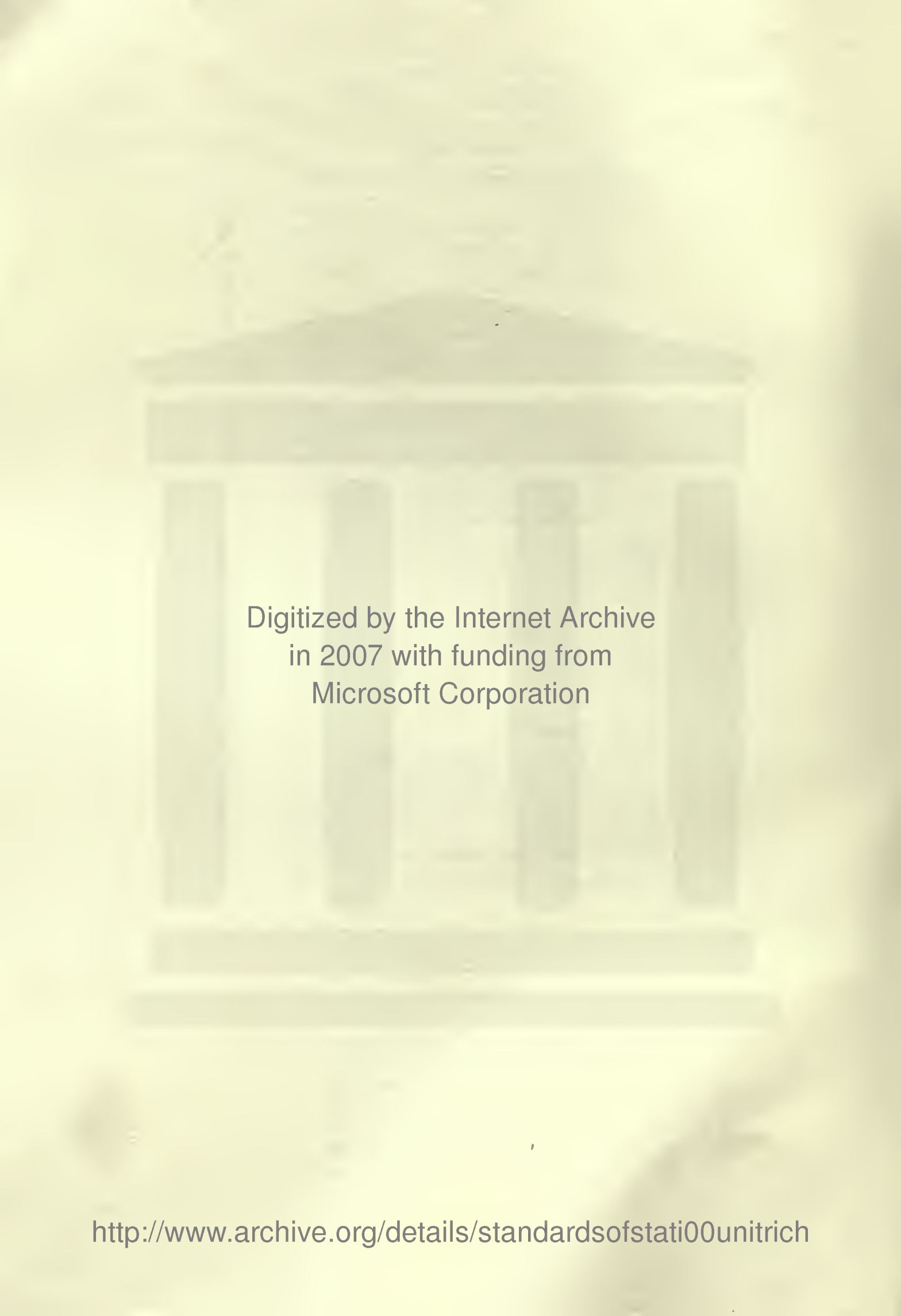
5. FORMAT 108
Report Format 108
Page Format 110
Binding Methods 115

6. PRODUCTION TECHNIQUES 117
Organizing the Material 117
Preparing Copy 117
Processing Copy 121
Assembling Copy 121
Proofreading 122

7. DISPLAY PRESENTATION 126
Display Methods 127
Choosing Between Projections and Posters 127
Projection Displays 128
Poster Displays 130
Lettering for Displays 130
Shading Displays 132
Color in Displays 133
Hints for Oral Presentations 134

List of References 135

Index 137


Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/standardsofstati00unitrich

CHAPTER 1
PRESENTATION

The presentation of statistical data requires careful planning and the thoughtful application of principles and procedures covering the design, preparation, and reproduction of text, tables, and charts.

Presentation is important because it communicates the results of the whole chain of statistical operations, including the collection, compilation, processing and analysis of data. The effort required for presentation is usually small in comparison to the effort required for the earlier operations.

What appears on a few pieces of paper is often the only useful product of thousands of dollars and man-hours spent in the various steps necessary to assemble the basic data. The value of this effort may be lost if the results are not presented effectively.

Some material that is poorly presented can be understood if the viewer spends enough time and effort in studying it; but sometimes an entire statistical program has failed because the findings were not properly presented and management did not have the time, patience, or knowledge to interpret them correctly. Too often, statistical reports cannot be interpreted correctly unless they are explained orally by the persons responsible for their preparation.

Good presentation greatly increases the probability that the statistical product will be understood clearly and accurately and will be used properly as a basis for making decisions.

Before data are collected and compiled, decisions should be made as to the purposes they are intended to serve, the audience they are to reach, and the form in which they will ultimately be presented. Before the physical design of reported material is begun, decisions should be made as to how the data are going to be produced, reproduced, and distributed.

Decisions as to which data to include, which to emphasize most strongly, which to present in detail and which in summary form, which to present in charts and which in tables, frequently require the use of analysis as well as presentation techniques. These decisions are influenced by the nature of the data, the scope, format, and purposes of the report, and the availability of time, equipment, and personnel.

Analysis and presentation may be regarded as separate problems, but in practice they can not be entirely separated. Analysis includes some presentation and presentation includes some analysis.

Whenever possible, analyses should be presented and presentations should be designed to highlight the most significant conclusions and facts developed through the analysis process.

An understanding of the techniques of presentation enables the statistician to prepare a more understandable and convincing analysis; but perfection in format, typography, and the general appearance of a report cannot substitute for sound analysis.

QUALITIES OF GOOD PRESENTATION

Many of the principles of good presentation are so obviously matters of simple common sense that it seems almost unnecessary to call attention to them, but their application sometimes is not a simple matter.

To be fully effective, statistical material must be presented in a form that can be clearly understood and readily used at the level which it is intended to serve. Statistical information for management should be presented in terms of management problems and interests.

Management is generally not interested in statistical techniques or terminology. Terms such as "skewness" produce only impatient mystification in the mind of the average administrator, yet he may be much interested in the problems or the conditions that are indicated by a skewed distribution.

On the other hand, material intended only for trained technicians should be designed to meet the needs and experience of that group. A particular style and method of presentation is effective only insofar as it performs a specific mission for a specific audience.

It is the failure to recognize this point that produces one kind of poor presentation, and helps to create impatience with statistics and statistical reports.

Statisticians have a tendency to make their presentations more technical and more involved than they should be when writing for non-technical audiences. This is partly a matter of self-indulgence and partly a failure to recognize the nature of the audiences and their limitations and needs.

Simplicity is a matter not only of form but also of concept. The presentation may be physically simple, yet not clear in meaning because the concept is obscure or involved. Of course, it is possible to present statistical information too simply, and in doing so to run the risk of offending the reader; but it is better to offend him in this respect than to present him with material he cannot understand at all or can fathom only at the cost of considerable time and effort. On the other hand, simplicity and clarity are different things; and it is impossible to present anything too clearly.

Providing the reader with all the information available on a subject is seldom good presentation. Presentation as well as analysis is a selective process and many of the results of analysis must often be sacrificed in order to focus the reader's attention on the more salient facts and conclusions.

The question to be asked before presenting any statistical material should be "What do we want to show?" rather than "What information do we have that can be shown?" Having determined the central idea to be derived from the data, the presentation should be built around it. This principle applies whether a single chart or an entire report is being presented.

MAJOR PROBLEMS IN PRESENTATION

Most of the problems of statistical presentation can be covered by two questions:

1. What is the best way to present the information?

2. How nearly can this be done with available people, equipment, and time?

To answer these questions the statistical analyst should know how the information ought to be presented, and how to get it presented.

For the first step he must know something about how statistical information can be presented, what forms are best for what purposes, and when to use which.

For the second step he must know something about what can and cannot be done with a typewriter, what skills and equipment are needed to prepare a chart, and what kinds of copies can be obtained from available reproduction processes.

It is important also that the analyst knows how to write readable and informative text and to design clear and useful charts and tables. He must also know how to get these things produced and how to put them together into a presentation that helps the reader to find out what he needs to know as easily, as quickly, and as completely as possible.

TYPICAL ERRORS IN REPORT PRESENTATION

Understandable to the Writer but not the Reader

This error may occur because of a number of faults: poor organization, foggy writing, use of technical jargon and unfamiliar abbreviations, poorly planned or designed illustrations or tables, or incomplete explanation of what the data represent. The most frequent fault occurs because the writer forgets that the reader does not know as much about the subject as he does.

Not Aimed at the Reader's Needs

The information carried may be accurate, meaningful, and clear; yet not pointed toward the reader's interest.

Different readers have different reasons for wanting to know about the same subject. Investors, employees, and customers have different interests in the material contained in a company's annual report. Doctors and patients have different interests in a report on public medical programs. A report on a new product interests the sales manager and the plant manager for different reasons.

Not Easy to Look At

It is a mistake to think that the only important thing about a report is the accuracy and significance of its content. The reader should be presented with something that is easy to look at. This means proper organization of the main components of the report, attractive layout of the pages, careful distribution of emphasis, and legible lettering. Many other design features should be given careful consideration.

Not in a Convenient Form

A report should be easy to handle, easy to use, and easy to store. Physical details such as size, shape, thickness, margins, and method of binding are important factors in good presentation. So are index tabs, covers, and colored separator sheets in some circumstances. No matter how valuable a report is or how clear and easy it is to understand, it is poorly presented if it is awkward to use.

Contains Too Much Material

Some reports have too many pages and some have too much material on the page. Even if the reader is eager to get the information, he will resent having to work his way through numerous unessential pages or through badly overcrowded pages to find what he is looking for. Presentation is a selective process: in order to get the reader's attention and focus it on the most significant facts, it is often necessary to omit many interesting sidelights, related data, and supporting documents that are informative, and possibly useful, but not actually needed.

MAJOR PROCEDURES IN PRESENTING DATA

The process of presenting data in statistical reports generally consists of eight basic steps or procedures. Some of these procedures may be fixed by the established policies or requirements or by decisions of higher authority. In any case, it is important to remember that each of these procedures is a distinct operation - and although some are not done as separate steps but are combined with others - each one must be thought about individually. The statistical analyst should keep all of them in mind because each one affects the others to some extent.

1. Define the Objectives

Supposedly no one undertakes the presentation of data unless he knows exactly what he is trying to do. Too often the objective is not defined specifically and a large amount of material is put on paper with only a general notion of the purpose it is to serve.

It is important for both the analyst and the reader to have the purpose of a report stated clearly. A carefully defined objective at the start may also prevent a lot of revision.

It is desirable for the analyst to write out on a piece of paper exactly what is intended to be communicated to a specific audience. This helps to clarify the objective.

If MEASURING PROGRESS is the primary purpose, care must be taken to be sure that the data are presented in such a way that they actually do measure progress.

The best general method of measuring progress is to relate results or actual performance to some program, standard or goal. Often, however, the nature of the subject is such that no absolute goal can be established. For some subjects, such as health, attainment of the theoretical goal (in this case the absence of all illness) is practically impossible.

Whenever a goal or objective is either lacking or unattainable, other yardsticks of progress must be substituted. Three alternative methods of showing progress are: (a) comparison of the same subject at two or more periods of time; (b) comparison of similar or comparable subjects at the same time period; and (c) comparison of similar subjects at two or more time periods.

Some Army statistical presentations serve groups with different interests. Such presentations may serve more than one purpose or reach more than one type of audience. If so, it may be necessary to make compromises that will make it more difficult for any one audience to use the material effectively or efficiently.

2. Choose the Medium of Presentation

Decide what physical means are to be used to transmit the information. It might be a published 8" x 10.5" report; it might be an oral presentation with display charts or film projections; or it might even be a self-contained, sound, moving picture. (See AR 108-6, Motion Picture Production.)

This step is not necessarily step number 2. It may turn out to be step number 3 or step number 4, or at some point it may be decided to use more than one medium.

The physical means of presentation, however, often controls many of the other steps of presentation; and for that reason it should be determined as early as possible.

The reproduced written report is the best method of communicating when the audience is large and dispersed and when the data are likely to be needed by many offices as reference material in the future. Examples are reports that summarize the strength and health of the Army.

Oral briefings with poster display charts or film projections are frequently preferred by high-ranking officers who have little time to read.

Occasionally, a long, written report prepared at the request of higher authority is condensed to a short, oral presentation to facilitate coordination with other staff agencies and approval by senior officers.

3. Select the Material

Many people who work with statistics do not realize that selecting the material is a part of presentation. However, in the larger sense, presentation is an editorial job. The analyst must determine what information he would like to give the reader, and how much volume he can expect the reader to examine. He must also determine what specific information will best convey the essentials of the story, and how much detailed data must be included to support or supplement the major conclusions.

In recurring reports the selection of material should be changed as events unfold. If a crisis develops in a specific area more emphasis should be given to the men, money, and materials committed to that area.

4. Construct the Story

The next step is to work out the sequence of the material and to decide what emphasis each item should receive. Actually, this step and the preceding one are seldom performed separately, but are usually a joint operation.

Many different impressions can be obtained from any given compilation of data, depending upon what order and emphasis are used and what interpretation is suggested. Sometimes the nature of the material will fix the sequence and suggest the emphasis.

5. Select the Form of Presentation

This step also is seldom performed separately. Usually decisions as to what to show in text, tabular, or graphic form begin to develop early in the organization and analysis of the data. In handling mass data, it is often difficult to know just what form of presentation to use until summary tabulations and comparisons have been made, and these usually cannot be made until the analysis is nearing completion.

Some types of data almost always suggest a particular form of presentation, but it is poor presentation to use a particular form just because it happens to be the easiest thing to do.

It is important to remember that text, tables, and charts each have specific advantages and disadvantages, and that it makes a difference whether the data are presented in one form or another. Each form performs certain functions that the others cannot do as well. Some of the factors to be considered when choosing between these forms are discussed in more detail at the end of this chapter.

6. Produce the Presentation

The preparation of reproduced statistical reports, surveys, reviews, studies, or analyses - whether in the form of single sheets, bound books, or large displays - is a special type of publishing activity; and it is important to recognize it as such.

After decisions have been made as to what to do and how to do it, the manufacturing problem must be faced. In the publishing business the product is made better and easier by setting up production aids such as typographic and style standards, standard page layout forms and specifications, and by otherwise organizing to do the work systematically and efficiently.

Statistical reports and similar products can be produced in this same way, especially when this material is to be produced in large quantities, or in small quantities at frequent intervals.

Most Army statistical presentation is restricted by the limitations of the typewriter. This is a poor excuse, however, for inferior presentation. This manual attempts to show how excellent results can be obtained by using only a typewriter, and even better results by combining the typewriter with other available means of putting information on paper. There is a great difference between getting the most out of a typewriter and getting less than the most.

7. Reproduce the Presentation.

Most presentations are reproduced in order to obtain more than one copy. Reproduction problems take two forms: using the wrong process, and using the right process but using it poorly. An understanding of all available reproduction methods helps to avoid both.

8. Transmit the Final Product.

Transmittal is not usually a problem, or only a very small problem. It is a step, however, that should be considered carefully. Even in transmitting a report through the mail, there is a problem of whether or not to send a letter of transmittal and if so, what to say in it. When transmittal of the information is a direct, face-to-face process, as in a briefing or conference, the problems are quite different, and frequently they are more complex.

No matter how the information is transmitted, this is a separate step of presentation and one that should be considered as an individual problem.

THE THREE FORMS OF PRESENTATION

The statistical analyst can choose from three forms of presentation:

1. Text
2. Tables
3. Charts

Each has its own advantages and its limitations. Reports that are all text, all tables, or all charts are useful for limited purposes but for the reasons given below they frequently do not make the best use of the material.

All Text. This type of presentation is not suitable for most statistical reports because only a relatively small number of figures can be included in text without confusing the reader. The very nature of statistics leads to numerical comparisons, and, except for the simplest cases, these can be made better in charts or tables than in text.

All text reports may be satisfactory when the statistics are extremely few or fragmentary, or when the data are not good enough to show in tabular or graphic form.

All Tables. Although tabular material is the backbone of statistical reporting, all-tabular reports are seldom readable. All tables and no charts or text make a dull report. Unless the reader knows exactly what to look for and where to find it, important comparisons and other facts are often missed, and much effort is wasted examining unimportant details. All-tabular reports lack the connective and interpretive qualities of good text, and the interest and forcefulness of charts. 1/

All Charts. Because graphic presentation is attractive and forceful, there is a temptation to prepare statistical reports containing nothing but charts. Such reports are effective for two purposes: to provide a collection of "high spots" calling the reader's attention to a few important points, or to provide a set of reference charts which, except for the current details, are already familiar to the reader.

For reports serving any other purpose - in other words, in most cases - all-graphic presentation is not satisfactory because it lacks a smooth flow of thought, and because it leaves too many questions unanswered. Some of these shortcomings can be overcome by using a "narrative" style of chart presentation (in which the title is expanded into a statement concerning the chart). See "Chart Style," page 76.

A graphic presentation given at a briefing or conference is not all graphic - but is accompanied by oral explanation.

Text + Tables + Charts. Reports generally are more useful if two forms of presentation are used rather than one; but to be fully effective, a combination of all the three forms is usually needed. In general, use text to describe and explain the statistics, use charts for emphasis, and tables to reinforce both text and charts.

Determining the proper balance is a matter of judgment: it depends partly on the purpose of the report and partly on the nature of the material. One general principle should always be followed: text, tables, and charts should be mutually supporting instead of independent.

Charts or Tables. It is often a waste of space and of the reader's attention, to show identical material in both graphic and tabular form, but it is highly desirable to have supporting tabular data or specific references to these data for all published charts.

One way to solve this problem is to include both a table and a chart but to give each a different arrangement. For example, a chart showing percentages might be accompanied by a table containing the absolute amounts for the same information; or the chart might show totals and the table a detailed breakdown of the totals. In this way, chart and table support one another but show information that is different enough to warrant the use of both.

Choosing Between Text, Charts, and Tables. It is unreasonable to ask the reader to read in text what he can plainly see in the charts and tables. The text should give key figures, but it should be used to emphasize and explain what the charts and tables mean.

The following three chapters, "Text Presentation," "Tabular Presentation," and "Graphic Presentation" explain in more detail how and when to use each form and how to get the most out of them. The "Display Presentation" chapter points out some of the special problems of planning, designing, and using statistical material to be viewed by a number of persons at more than the normal reading distance.

1/ In reports prepared mainly for reference - that is, those intended to give detailed information about a long list of items - a large volume of tabular material is necessary. Reports of this type, however, should begin with a summary or analysis of the tabular data.

CHAPTER 2
TEXT PRESENTATION

In most statistical publications the reader must be told a great many things that cannot be shown in tables and charts. He must often be told why, when, what, and how. Sometimes he must be told the meaning of the charts and tables shown him. In an oral report, all this is done by the speaker. In a written report, it must be done by text.

Text should be used:

1. To introduce.

2. To interpret or explain.

3. To emphasize.

4. To connect.

5. To summarize.

If none of these needs to be done, text is not needed.

The aim in the preparation of text should be to present clearly, accurately, and briefly the information needed to understand and interpret the statistical data in the charts and tables. The text should summarize, emphasize, supplement, or amplify - but never duplicate in detail - the graphic and tabular material.

HOW TO WRITE TEXT

Written words differ from spoken words in several ways. Spoken words can be supplemented with gestures, variations in the expression on the speaker's face, and changes in the tone and inflection of his voice. The speaker can watch to see if the listener seems to understand what he is saying. Written words do not have any of these aids.

Punctuation, spacing, changes in the size and style of type, help some; but it is harder to tell someone what you mean in written words than it is in spoken words.

Useful suggestions for the composition of text are given in DA Pamphlet No. 1-10, "Improve Your Writing." This pamphlet also lists (in Appendix I) a number of reference books concerning better writing that are available in libraries and bookstores.

To write good text it is important to use short, familiar, specific words and to avoid needless words. It is also important to avoid unnecessary repetition. Coherent, unified and well organized sentences and paragraphs are basic requirements for presenting material in a forceful, emphatic manner.

In statistical text the objective is clear expression of thought without a colloquial or slangy tone. Do not sacrifice meaning for brevity; if the longer word is needed for precision then do not hesitate to use it.

Use the active voice generally, the passive voice less often: this will result in shorter and stronger sentences.

Emphasis

Emphasis may be achieved in several ways. Among them are the following:

1. Allocate space to the various subjects and to the various items in a subject according to their importance.

2. Put the most important sentence (the topic sentence) in an emphatic spot in the paragraph - usually the first or last sentence.

3. Use subject headings (chapter, major subdivision, minor subdivision and minor subdivision headings) to call attention to the important topics covered.

4. Support the text with charts and tables.

5. Use ALL CAPITALS or underscoring to emphasize key words, phrases, or clauses, but use them sparingly.

6. List important facts numerically.

MECHANICS OF STYLE

In writing text, questions frequently arise concerning punctuation, abbreviations, spelling, hyphenation, and various other mechanical aspects of style, since in English there are often several acceptable forms. Although these alternatives do exist, it is advisable to follow one style or system consistently within a report or series of reports.

References

The STYLE MANUAL of the U.S. Government Printing Office provides a wealth of guidance material on the accepted rules of capitalization, spelling, compound words, punctuation, abbreviations and other standards of form and style. Its supplement, "Word Division," gives rules for and examples of line-end wordbreaking.

The DICTIONARY OF UNITED STATES ARMY TERMS, Army Regulations 320-5, contains terms of particular interest to the Army. The DICTIONARY OF UNITED STATES MILITARY TERMS FOR JOINT USAGE (Joint Chief of Staff Publication 1) contains terms of specific significance to two or more military departments. AR 320-50, AUTHORIZED ABBREVIATIONS AND BREVITY CODE, contains a comprehensive list of abbreviations. Most good dictionaries also provide general guidance.

Punctuation

Proper punctuation is a "must" in text writing. Otherwise, sentences may not make sense or may have meanings not intended by the writer. Two controlling principles are to:

1. Use punctuation marks to clarify the text and to make reading easier and faster. Omit punctuation marks which do not accomplish these purposes.

2. Use the correct punctuation marks. Each type of mark (comma, apostrophe, colon, semicolon, period, etc.) has specific uses. Incorrect punctuation is more confusing than too little, or none at all.

Abbreviations

Abbreviations often perform a real service to the reader by cutting down his reading time. If used to excess, however, they make text look clumsy and undignified.

If abbreviations are incorrectly used, or are not easily understood, they are confusing and make reading more difficult. It is generally best not to abbreviate; but if done, these rules should be followed:

1. Abbreviate carefully and sparingly.

2. Abbreviate only if it is believed that most of the readers will be familiar with the abbreviations.

It is now common practice to use capitalized initials for the names of government agencies and other organized bodies when the meaning is clear (FBI, TVA, NATO), and for well-known contractions of military terms (DOD, MOS, AWOL).

The reader should be told the meanings of all but the most obvious abbreviations. For example, a report intended solely for Army personnel need not define ROTC, RA, or TAG; however, if the report reaches non-Army readers, definitions should be furnished: Reserve Officers Training Corps, Regular Army, The Adjutant General.

One way to tell the reader is to write the meaning (or the abbreviation) in parenthesis the first time an abbreviation is used. Another way is to furnish the definitions in an introduction or in a separate glossary immediately following the introduction. Sometimes the two methods may be combined.

The following standards apply to signs and symbols:

Sign or Symbol	Can be Used:	
	In Text	In Charts and Tables
# (number)	No	No
¢ (cents)	No	No
$ (dollars)	Yes	Yes
& (and)	No	Yes a/
% (percent) b/	No	Yes a/

a/ Avoid when possible. Use only when space is exceedingly tight.
b/ Always spell as one word.

NUMBERS IN TEXT

When and How to Use Figures

In articles, stories, and news accounts, the rule is to spell out most numbers that take no more than four or five words. In statistical reports, the rule generally is that all numbers ten and above are put in figures because there are so many figures and because they are usually the focus of attention. This not only saves a large amount of space but also makes the numbers easier to locate and compare.

Use figures for:

1. Numbers that are ten and above.

2. Money amounts: (5 cents, $0.05; $5, 5 dollars; $5,000,000, $5 million; 5 million dollars; $64.81).

3. Dates (conventional: December 7, 1941; military: 7 December 1941).

4. Time of day (conventional: 8 a.m., 3:15 p.m.; military: 0800 hours, 1515 hours).

5. Decimals (2.8, 0.25, 9.05).

6. Serial or reference numbers (Chapter 8, page 12, paragraph 2, column 6, line 58, Figure 5, Table 10, Chart 1).

7. Measurements (8 inches, 2 feet, 7 tons, 5 miles, 1 percent, 2 x 4's, 2 hours 4 seconds, 10 acres, 3 gallons, 6 pounds).

8. Unit modifiers (5-day week, a 5 percent increase, 1/2-inch pipe).

9. Numbered United States Army military unit designations, (other than the numerals for U.S. armies, which are spelled out) and Roman numerals for Corps (3rd Armored Division, First Army, II Corps).

10. A group or series of numbers when any is 10 or more (9 majors and 16 captains reported; 8 trucks and 10 drivers were needed).

Spell out:

1. Most numbers less than ten within a sentence (these three compounds, a six-month forecast, nine changes).

2. Numbers that begin a sentence. Generally it is better to reword the sentence.

3. Numbers of United States armies (Third United States Army).

4. Numbers used formally as in titles (Federal Statistical Directory, Nineteenth Edition, the Thirteen Original States); unusually dignified subjects, or names of centuries (twentieth century).

Other rules to follow are:

1. Use commas in numbers with more than three digits (8,296, $35,701). This rule does not apply to dates, serial numbers, page numbers, military time, or digits to the right of a decimal point.

2. In decimal numbers, put a "0" before the decimal point if there is no unit (0.16).

3. Do not use a decimal point and ciphers to express a money amount consisting only of dollars unless the amount is in a series including at least one figure in dollars and cents. (He had a $1,000 exemption; His expenses were $5.25 for food and $8.00 for rent; but, His expenses were $5 for food and $8 for rent.).

4. Do not repeat a spelled out number in figures (five trucks, not five (5) trucks).

5. Avoid sentence structure which puts figures immediately before or after a numerical segment of a date (Wrong: more than 60,000 1965 models had defects; Right: more than 60,000 of the 1965 models had defects; Wrong: on 31 March 1945, 7,260 items were in the inventory; Right: on 31 March 1945, the inventory totaled 7,260 items).

Simplifying Figures

Figures are much easier for the reader to think about if they are simplified. The more figures there are the more important it is to simplify them. Three ways of doing this are shown below:

1. Simplify individual figures by rounding.

2. Simplify groups of figures by averaging.

3. Simplify the relationship between figures by using percentages and other ratios.

When and how to use each method depends on the problem. Sometimes all three can be used effectively.

Simplifying by Rounding. Rounding is a method of getting rid of needless detail. The purpose of rounding is to focus the attention on an approximate magnitude. A figure of $40,000 is easier to grasp and remember than $39,992.54; and 95 percent is generally easier to comprehend than 94.89 percent.

Rounding also makes relationships easier to see. Comparing 39,892.54 with 19,946.27 is much simpler if we know that the first number is about twice the second. Rounding the figures to 40,000 and 20,000 makes this clear at a glance.

By-Products of Rounding. Rounding is useful for other reasons besides making figures simpler. Sometimes it helps to make the figures realistic.

Unrounded figures may seem more accurate or exact than they are. Many figures are computed or estimated rather than obtained by counting or measuring: they appear to be exact only because they have been carried to several digits in computing. For example, if you divide 100 people by three, you get an answer of 33.33+ people; but this does not mean that each third has 33 1/3 people. Many other computed figures are just as illogical as this one when carried out to too many digits. Rounding should not be done until all computations are completed.

Rounding is almost always preferable when the figure is an estimate. An estimate is at best only an approximate calculation. An unrounded estimate seldom is as accurate as it seems.

Large rounded figures are easier to think about if some of the zeroes are trimmed off. For example, the figure 10,000,000 is better for thinking purposes if written 10 million, and 8,900,000,000 is much easier to handle if written 8.9 billion.

ARRANGEMENT OF TEXT

Much of the clarity of report presentation depends on arranging the parts in a logical order and identifying them so clearly that the organization of the material may be readily apparent to the reader. The planning of headings and subheadings often reveals weaknesses in organization or content such as omissions, faulty sequences, and repetition or overlapping.

Headings and Subheadings

Headings indicate where different subjects begin. They introduce the various divisions and subdivisions of the report. Headings on each level of subordination are treated alike and they differ in appearance from those on other levels. In typewritten reports, these similarities and differences are obtained by using all capital letters, capital and lower case letters, underscoring, and indentation, and by leaving blank lines above or below the heading.

A number of acceptable systems of headings may be followed. The standard adopted in this pamphlet is simple and yet provides for enough degrees of subordination to meet the requirements of most reports. It is described below in the order of succeeding levels of subordination.

CHAPTER HEADINGS

These are capitals, larger and much heavier than the Elite capitals provided on standard typewriters, of the same type face as the running heads, centered without underscoring. Chapter headings should appear at the top of the page. They indicate the principal divisions or components of a publication.

SECTION HEADINGS

These are also capitals somewhat larger than typewritten Elite capitals, placed flush with the left margin without underscoring. Leave one blank line below each heading and two above it, unless it is at the top of a page. They indicate major subdivisions of chapters.

MAJOR SUBDIVISION HEADINGS

These are standard Elite typewriter capitals, placed flush with the left margin of the column, without underscoring. Leave one blank line between the heading and the following paragraph, and two blank lines between the heading and text above. These headings indicate the major subdivisions within the subject matter covered by section headings. Short sections do not always need major subdivision headings.

Minor Subdivision Headings

These are initial capitals for all words except articles, prepositions, and conjunctions, placed flush with the left margin and underscored.* Do not leave a blank line between this heading and the following paragraph - begin the text on the next line. Leave only one blank line between the heading and any text above it.

* All underscoring should be done with drafting pen and ink.

Minor Subdivision Component Headings. These are initial capitals, indented five spaces from left margin of the column (ten spaces in one-column text), and underscored. This heading is followed by a period, two blank spaces, and the first words of the text (on the same line as the heading if there is room for them). Leave one blank line between the heading and the text above.

KEY LEAD WORDS may be put in all capitals in the first sentence of a paragraph to give these words emphasis. All capitals later in the paragraph are also used as ATTENTION-GETTERS.

Another alternative method of achieving a similar result is to underscore like this. Both all capitals and underscoring, when used with discretion add to the variety and attractiveness of a report.

The number of different levels of subordination needed depends on the length and complexity of the report. Short simple reports may need only two or three levels of subordination. It is desirable to separate consecutive headings by at least one paragraph of text.

The words selected for headings should be carefully chosen and reviewed to make certain that they are concise, yet clear and consistent.

Body of the Text

The body of the text is single spaced, when typed for reproduction. Preliminary manuscript is usually double spaced or typed in one of the two columns of typing layout sheets to make editing easier.

Rules for paragraphs:

1. Separate paragraphs by one blank line. (This may be omitted if space is tight).

2. Indent the first lines of paragraphs: five spaces (start in the sixth typewriter space) in two-column text, and ten spaces (start in the eleventh space) in one-column text.

3. Do not number paragraphs, but do indent and number listings, such as this, which are a part of a paragraph. The numbers are indented five spaces in two-column text and ten spaces in one-column text. Leaving a blank line between the items in the listing is optional, depending on the number of items, their length, and the availability of space on the page. In listings containing long items it is better to allow the blank line if possible.

4. When the text is continued on a second column or page, carry it over to that column or page and leave at the bottom of the first column or page not less than two lines of a paragraph.

Sometimes a little stretching or squeezing is needed to make a column of text come out to just the right length without rewriting. If it is a little too short, put an extra blank line between paragraphs or above major or minor subdivision headings. If it is a little too long for the page, first try to continue the last paragraph (or some of it) on the next column.

Then, if any paragraph contains a numbered listing of items or if the column contains any major subdivision heading, consider deleting the blank lines between the items or reducing the blank spaces above the heading to one line.

The appearance of a short listing with no item longer than two or three lines may sometimes be improved by typing the second and third lines of each item flush with the first (normally in the 10th typewriter space). This procedure may also be followed in listings with longer items to fill surplus space when fitting text to a page.

Text footnotes are placed at the bottom of the page. In two-column text, they appear beneath the column to which they apply. They are separated from the rest of the text by a line 0.01 inch thick, drawn with a ruling pen and ink.

This line is 20 typewriter spaces wide in one-column presentations and 10 wide in two-column arrangements. A blank typewriter line is left above the ruling, but none below: begin the first text footnote in the first line below the ruling.

The standard reference symbol if there is only one text footnote on the page is the asterisk (*). Two or more text footnotes on the same page are identified by numbers in series, which are indicated as reference symbols by a diagonal and an underscore, 1/.

Other commonly used footnoting systems for formal reports number the text footnotes consecutively from the beginning to the end of each chapter or of the entire report or publication.

In the body of the text put the reference symbol immediately after its point of reference, with no blank space intervening if the symbol is an asterisk, but with a one-space separation if the symbol is a number. For example:

...obligations* and expenditures...
...procurement actions 1/ for the year...

The reference symbol should be placed after punctuation marks:

...of September enlistments.* They were...
...peak workloads: 1/ The estimate was...

But not after a dash:

...vehicles - combat only 3/ - in the...

Or a closing parenthesis if it refers only to the material inside the parenthesis:

...index (based on 1965 prices*) rose...

Some other important rules to remember about text footnotes are:

1. Single space all footnotes: no extra space between lines of the same note or between notes.
2. Start each footnote with the reference symbol at the left margin of the page in one-column text and at the left margin of the appropriate column in two-column text.
3. Begin the first word after a symbol in the fourth space from the left margin if the reference symbol is an asterisk and in the fifth space if it is a number.

EXAMPLES of text footnotes are given below:

---

* On a page of two-column text, place a single footnote at the bottom of the column in which the reference occurs.

---

* In one-column text the ruled line would be two times as wide (20 typewriter spaces) and the footnote would be a full page wide.

Place more than one footnote in series at the bottom of a column.

1/ The first word of a footnote starts in the fifth space if the symbol is a number and in the fourth space if it is an asterisk.
2/ Use numbers if each column on a two-column page has a single footnote: put footnote 1/ at the bottom of the first column and footnote 2/ at the bottom of the second column.

JUSTIFYING

When text is set up in printer's type, all the lines are made to come out even at the right. This leaves an even margin on the right side of the page, just as on the left. When text is typed on a typewriter, however, the lines seldom come out evenly, leaving an irregular margin at the right. This is one of the things that gives typewritten reports an unprofessional look.

Some of the unevenness can be avoided if the typist breaks words that would extend beyond the standard length of line (instead of carrying the whole word to the next line).

All of the lines can be made exactly the same length by spreading the short lines, and squeezing the long lines. This process of fitting text lines to a standard length line is called "Justifying".

Many typing jobs should not be justified. For formal reproduced reports, justifying is often worth the extra effort; but for most typing, it usually is not. Short, informal reports and statistical text typed in letter or memorandum form should not be justified. In many rush jobs there simply is not time to do it, even if it should be done.

Justifying on a Typewriter

Spreading lines is not as easy for the typist as it is for the typesetter. The typesetter presses a button and the extra space is spread evenly throughout the line; the typist usually must insert the extra space in units of a whole typewriter space, which means that the typewritten line will appear to have breaks in it. In using a standard office typewriter, there is no way to avoid these space breaks: the objective is to make them as inconspicuous as possible.*

---

* Some typewriters have devices for spreading the extra space evenly throughout the line. Some others have a special space bar that lets the typist insert half spaces instead of full spaces. Either of these methods is better than inserting full spaces; but until such a device becomes standard equipment on typewriters, space must be inserted in whole units.

The two general rules for inserting extra spaces in a line are: (1) spread them as evenly as possible throughout the line and (2) place them where they will be least noticed; i.e., between sentences, following commas, or where a natural pause in the sentence occurs. If possible, place them where they will be spanned by a long word in the lines above and/or below.

It is inadvisable to leave more than one extra space between words; and seldom feasible to distribute more than four or five extra spaces to a line of two-column text, or more than five or six extra spaces to a line of text if it is one column wide.

Taking out space to squeeze a long line is more difficult than inserting spaces. The only easy places to eliminate a whole space are after a period or a colon.

A good typist, however, can usually squeeze two half-spaces out of a line, especially if it has a period or a colon in it. As a general rule, however, if the last word is only one letter too long, it should not be broken or carried to the next line. If the line is more than one letter too long, do not squeeze it.

Frequently the best solution to a bad space problem is to change one or more words or to rewrite a sentence.

Three Steps in Justifying

Three steps may be taken to make typewritten lines come out evenly:

1. The typist first fills out all short lines with asterisks to show how many spaces must be buried in the line to make it come out evenly. The protruding letter (or punctuation mark) at the ends of lines that are only one space too long is all that is needed to show that those lines must be squeezed one space.

2. The author (or the typist) next marks this trial typing with "hash" marks to show where the spaces should be inserted (or taken out).

3. Finally, the typist retypes the text in final form, inserting or squeezing spaces where marked.

Paragraph Typed Without Justifying

"We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America."

Step 1: Typed for Justifying

"We, the people of the United States, in*** order to form a more perfect union, establish*** justice, insure domestic tranquility, provide*** for the common defense, promote the general welfare, and secure the blessings of liberty to**** ourselves and our posterity, do ordain and es-** tablish this Constitution for the United States* of America."

Step 2: Marked for Final Typing

"We,/the people/of the United States,/in*** order/to form/a more perfect union,/establish*** justice,/insure domestic/tranquility,/provide*** for the common defense, promote the general welfare,/and secure/the blessings/of/liberty to**** ourselves/and our posterity,/do ordain and es-** tablish/this Constitution for the United States* of America."

Step 3: After Justifying

"We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America."

Justifying is Easier Than it Looks

Making typed lines come out even at the right takes more work, but it need not take much more. If everyone who has to work on the text knows at the start that it is going to be justified, each step in the preparation is made with this end in mind.

The typist's work should be made as easy as possible by providing her with typing layout sheets (paper printed with guide lines that match the typewriter spacing). (See "Typing Layout Sheets", page 117).

Word Division

It is frequently desirable to break the last words of certain lines in order to make the lines more nearly even. When lines are to be justified, breaking words is even more important. If the typist does not break a word at the end of a line, but carries it over to the next line, she will have to add more spaces between words to bring the line out to the full width of the page or column.

The Word Division supplement to the GPO Style Manual referred to on the first page of this chapter was prepared primarily for printers but is intended to give guidance to typists as well.

It gives extensive detailed rules for breaking words and is a quick-reference aid for finding correct word breaks. It lists words broken into syllables but does not define them. The 1962 edition measures 3" x 5", contains 190 pages and costs 50 cents.

Some General Rules for Breaking Words are given below:

1. Break words only between syllables. If in doubt, consult the GPO Word Division Booklet or a dictionary.

2. Do not break words of one syllable, regardless of their length: straight, through, range, etc.

3. Do not break any word - short or long - that would leave a single letter standing alone:

e- o- u-
lectric pinion niformity

4. Do not break the last word in a column or page.

5. Do not break numbers with less than six digits.

6. Avoid breaking words of five or less letters: in-to, da-ta, on-ly, etc.

7. Avoid the division of the final word of the last full line of a paragraph.

8. Avoid word breaks at the ends of more than two consecutive lines.

CHAPTER 3
TABULAR PRESENTATION

The presentation of data in tabular form or in tables is a basic statistical device. A statistical table is a systematic arrangement of numerical data in columns and rows. Its purpose is to present quantitative facts clearly, concisely, and effectively. It should facilitate an understanding of the logical relationships among the numbers presented.

Tables are used in the compilation of raw data, in the summarization and analysis processes, and in the presentation of statistics in final form. This chapter deals mainly with tables designed for reproduced typewritten reports prepared for Army use.

A good table is the product of hard work. It is not just a package of figures put into neat compartments and ruled to make it pretty. It contains carefully selected data, put together with thought and ingenuity to serve a specific purpose.

Tables are the backbone of most statistical reports. They provide the basic substance and the foundations upon which conclusions of the report are based.

WHY USE TABLES

Tables are used in Army reports for the following reasons:

1. Clarity - they present many items of data in an orderly and organized way.
2. Comprehension - they make it possible to compare many figures quickly.
3. Explicitness - they provide actual numbers which document data presented in any text and charts.
4. Economy - they save space - and words.
5. Convenience - they offer easy and rapid access to desired items of data.

The disadvantages of tables include the following:

1. Uninviting - tables generally look like difficult reading matter that could be ignored.
2. Undramatic - significant relationships are often hard to find and comprehend.
3. Specific - tabular data, because of their formal appearance, tend to make crude estimates and projections seem more precise than they actually are.

Much of the art of tabular presentation lies in the ability to maximize the advantages and minimize the disadvantages of this method.

Sometimes other methods of presentation are better:

1. Charts are often more effective for showing simple relationships, trends and general magnitudes.
2. When only a few key figures are to be presented it is often desirable to show them only in the text. This is especially true if the figures lack comparability and need explanation.

BASIC PRINCIPLES

The underlying principles of tabular presentation should be understood in order to design effective tables. Each table is more or less "custom made." The following statements indicate some of the essential considerations to be borne in mind:

Determine the need for tabular presentation and its appropriateness on the basis of number of figures to be presented, complexity of relationships between the figures, the requirements for precise data, and the use of alternative methods of presentation.

Define the purpose of each table in specific terms. This will aid in establishing the scope of the material to be presented and in determining how many tables are required. Each table must have a clear and definite purpose.

Plan the content of each table in accordance with its specific purpose. This is the key to selection of the items, their logical classification, and determination of the proper size of groupings. Determine the extent to which ratios, percentages, averages or other measures will sharpen the focus of the table on significant facts and relationships. Examine critically, every element planned for inclusion to be sure that it contributes to the accomplishment of the prime purpose of the table.

Design the table so that it will be easy to read and understand, and pleasing to the eye.

1. Make all titles, units of measure, headings, stubs and notes concise and unambiguous.
2. Distribute categories horizontally and vertically to produce properly balanced overall physical proportions.
3. Use optimum spacing, ruling and indention for quick and certain recognition of major and minor groups.
4. Carefully plan the sequences and arrangements of items and totals to present a rational progression and to emphasize significant relationships. Time sequence data should be from top to bottom or from left to right.
5. Place totals (which are generally of primary interest) at the top and to the left where they will be seen first. (See "Placement of Totals", page 28 and accompanying examples.)

Monitor production of the table to insure that:

1. The planned design has been followed.
2. Percentages, averages, ratios and any other computed data are accurate.
3. Figures have been verified by machine check and other components carefully proofread.
4. Appropriate type face and clean, sharp unbroken type have been used.
5. The table is properly balanced on the page.
6. The ruling and spacing contribute to the ease of reading and reference.

TABULAR FORMS

When designing tables careful consideration should be given to the purpose that the table is intended to serve, despite the fact that distinctions between purposes are not always clear. Three distinct types are available to meet different objectives:

1. Text tabulations (or text tables).
2. Special purpose (summary or analytical) tables.
3. General purpose (or reference) tables.

Text Tabulations are small, simple, informal tables inserted in the text. They are merely listings of data without titles. They are actually part of the text and they must be placed where their subject is discussed, immediately after a colon. They are usually but not always indented from both margins as shown in examples on this and the following page.

The purpose of these tables is to highlight relationships among a relatively small number of figures. They are intended to be read from beginning to end and should be limited to two or three columns. They provide as much clarity as other tables without as much interruption of the text.

Text tabulations are more appropriate for statements that are primarily narrative than for reports containing a considerable amount of statistical detail.

Special Purpose (Summary or Analytical) Tables show selected data arranged to focus attention on important comparisons and relationships. They are meant to be read from start to finish. They are usually shown with text, and frequently are placed in the summary. If they are simple enough, they can be used as inserts on charts or on maps.

General Purpose (Reference) Tables give comprehensive coverage of the subject covered by a report. In tables of this type the data are arranged so that any needed figure is as easy to find as possible. They are not meant for complete reading. They are "figure files" that the user refers to in about the same way he would look up a word in the dictionary.

Reference tables usually appear at the back of a report. They are backup material to be used if detail is needed to supplement data summarized in analytical tables or charts.

The distinctions between special purpose and general purpose tables are not precise: a special purpose table in one report might be a reference table in another, depending upon how the reader is expected to use it. The distinctions usually are not applicable to reports having only a few pages.

Both special and general purpose tables are formal tables. A formal table is as complete and self-explanatory as possible. It usually does not depend upon the text - but has its own title and other explanatory information needed to make its content clearly understood.

ARRANGING FIGURES FOR EMPHASIS

The location of figures within a table determines to a considerable extent the emphasis they will receive in the mind of the reader. In designing a table, therefore, it is important to consider carefully which comparisons are of the greatest significance and then arrange the figures so that these comparisons receive the most emphasis.

In tabular presentation, as elsewhere, the closer together things are the easier it is to compare or contrast them. The most effective way to bring two figures close together for visual comparison is to place one above the other. In this position the comparison may be made at a single glance. This is illustrated by the following example of a text tabulation:

Location	July
Fort A	30,250
Fort B	22,368

Placing the two figures side by side permits a somewhat less effective comparison:

Month	Fort A	Fort B
July . .	30,250	22,368

The presentation of two items of information for each fort necessitates additional choices. One way of doing this is shown below:

Location and Month	Number
Fort A	
July	30,250
August	27,942
Fort B	
July	22,368
August	25,715

This makes it necessary for the eyes to skip a figure in order to compare figures for the same month. But this arrangement may be used to emphasize comparisons of what happened from July to August at Fort A with what happened at Fort B. This could be done more directly, however, by adding figures for actual or percent changes.

In another arrangement shown below the eyes must move even farther to make the comparison:

Item	Camp A		Camp B	
	July	August	July	August
Number . . .	30,250	27,942	22,368	25,715

The same general principles can be applied to a series of figures. A list of figures in a column is easier to scan and to compare than the same figures listed across the table on the same line. In the vertical arrangement it is much easier to locate the largest and smallest figures, partly because any differences in the numbers of digits may be seen at a glance. It is also easier to look at a column of first digits

and quickly see the differences in the general size of the numbers. An example of a single column is shown below:

Year	Number
Jan	109,246
Feb	140,621
Mar	89,732
Apr	6,509
May	25,824

This quick scanning is harder to do when figures are on the same line:

Item	Jan	Feb	Mar	Apr	May
Number	109,246	140,621	89,732	6,509	25,824

The location of figures must often be influenced by other considerations. For example, the stub items or column headings sometimes must be put in a standard order that does not bring the most significant figures close together. Also, some figures may require comparison with so many others that some of them must be too far away for rapid comparison.

It is important to remember two basic principles:

1. Numbers close together are easiest to compare.
2. Vertical comparisons can be made more rapidly and effectively than horizontal comparisons.

COMMON FAULTS IN STATISTICAL TABLES

A table that is not properly designed is sometimes worse than no table at all. A check list of common faults, any one of which can spoil a table that is well designed otherwise, appears below:

1. Wrong emphasis - a summary table not arranged to focus attention on the most significant comparisons; or a reference table not designed for ease of locating individual figures.
2. Poor internal construction - lack of clear, logical, orderly relationships. This includes the lack of leaders and columns so wide that it is hard to associate figures and stub entries.
3. Not complete and self-sufficient - leaves unanswered important questions such as scope, content, time, etc.
4. Cluttered with extraneous data- figures required to compute totals, percentages or ratios, but not necessary for the primary purpose of the table.
5. Lettering hard to read - too small or poorly typed or reproduced.
6. Badly fitted to the space available - too cramped, too spread, or poorly proportioned.
7. Vague, ambiguous or incomplete column headings or stub nomenclature - failure to describe the data clearly.

BASIC TABULAR ARRANGEMENTS

In tabular presentation simplicity of design is just as important for quick, clear communication as it is in graphic presentation. All too often, however, it is necessary to use various more or less complex tabular arrangements to show desired detail and relationships among numbers.

The designer of tables should give consideration to three basic aspects of tabular arrangement:

1. Position on page: upright or broadside.
2. Pages required: single page or multipage.
3. Internal structure: treatment of stub and boxhead.

Alternative choices concerning each type of tabular arrangement are discussed and illustrated below.

The terms used in the discussion of tabular presentation to designate the component parts of a table are illustrated on the following page, with the exception of field spanners which are illustrated and discussed in detail on pages 14 and 19-37.

POSITION ON PAGE

Upright Table

The usual way to present a table is with the typing across the narrow dimension of the page in the same manner as the text. All of the tabular examples in this pamphlet are of this type.

Broadside Table

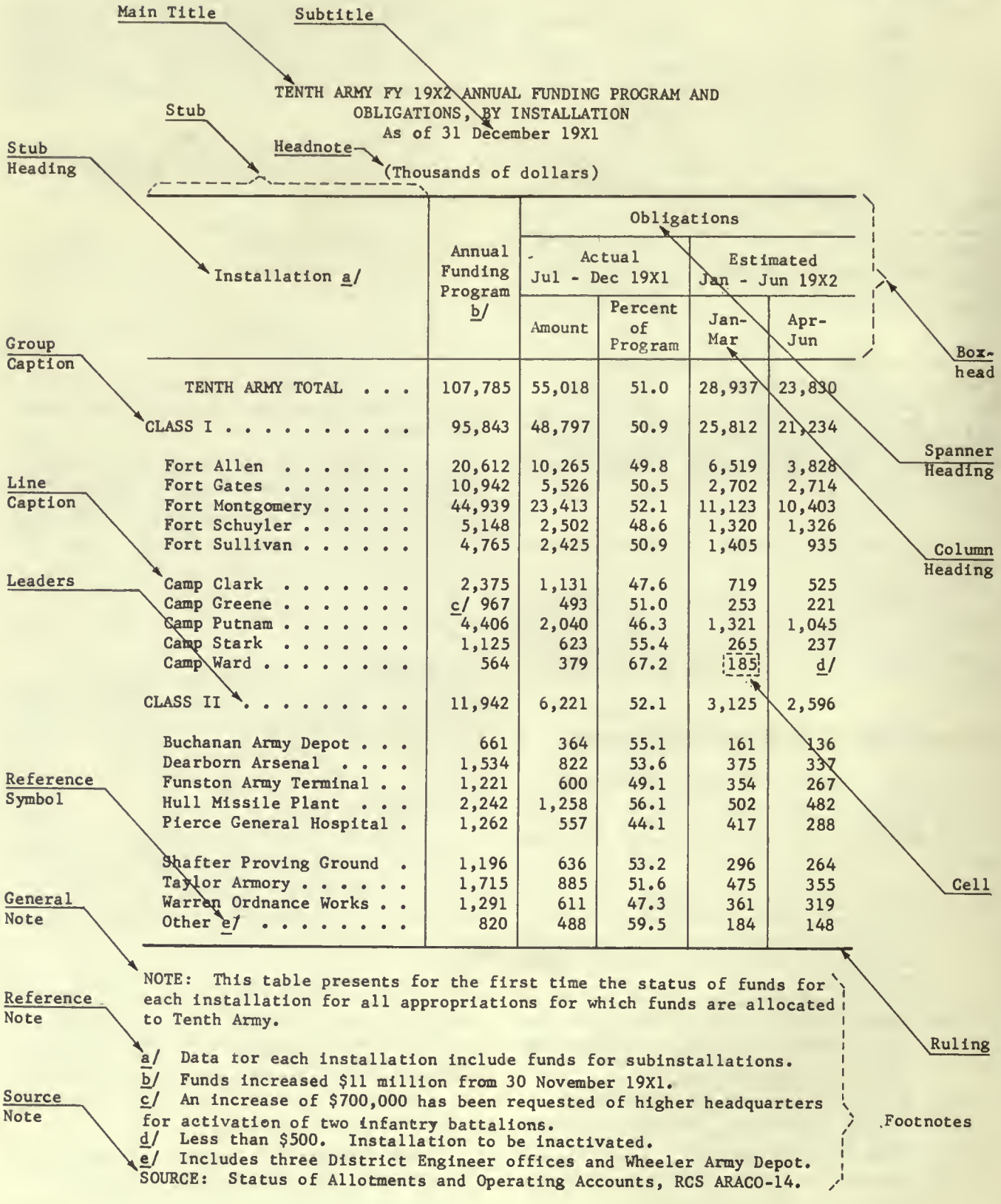
All too frequently, wide tables are typed across the broad side of the page - at right angles to the text and to the tables on other pages in the report. The report must then be turned sideways to read the tables, making it difficult for the reader to go back and forth from analysis to reference.

A broadside table can usually be redesigned to an upright type. Often its width can be reduced by reversing the position of the material in the stub and the boxhead, or otherwise changing its internal structure. The table might also be divided and shown upright on two facing pages as a double-page spread table, which is described below.

Another method of avoiding a broadside table (not involving redesign) is to force the table into the upright position by reducing it in reproduction more than the rest of the report. This decreases the legibility of the table, and increases the technical difficulties of planning and preparing the pages, as well as reproducing the final copy.

When a broadside table is used, it should be arranged so that its top is on the left side of the page.

TERMS USED IN DISCUSSING TABULAR PRESENTATION



TENTH ARMY FY 19X2 ANNUAL FUNDING PROGRAM AND OBLIGATIONS, BY INSTALLATION
As of 31 December 19X1

(Thousands of dollars)

Installation a/	Annual Funding Program b/	Obligations			
		Actual Jul - Dec 19X1		Estimated Jan - Jun 19X2	
		Amount	Percent of Program	Jan-Mar	Apr-Jun
TENTH ARMY TOTAL . . .	107,785	55,018	51.0	28,937	23,830
CLASS I	95,843	48,797	50.9	25,812	21,234
Fort Allen	20,612	10,265	49.8	6,519	3,828
Fort Gates	10,942	5,526	50.5	2,702	2,714
Fort Montgomery	44,939	23,413	52.1	11,123	10,403
Fort Schuyler	5,148	2,502	48.6	1,320	1,326
Fort Sullivan	4,765	2,425	50.9	1,405	935
Camp Clark	2,375	1,131	47.6	719	525
Camp Greene	c/ 967	493	51.0	253	221
Camp Putnam	4,406	2,040	46.3	1,321	1,045
Camp Stark	1,125	623	55.4	265	237
Camp Ward	564	379	67.2	185	d/
CLASS II	11,942	6,221	52.1	3,125	2,596
Buchanan Army Depot . . .	661	364	55.1	161	136
Dearborn Arsenal	1,534	822	53.6	375	337
Funston Army Terminal . .	1,221	600	49.1	354	267
Hull Missile Plant . . .	2,242	1,258	56.1	502	482
Pierce General Hospital .	1,262	557	44.1	417	288
Shafter Proving Ground .	1,196	636	53.2	296	264
Taylor Armory	1,715	885	51.6	475	355
Warren Ordnance Works . .	1,291	611	47.3	361	319
Other e/	820	488	59.5	184	148

NOTE: This table presents for the first time the status of funds for each installation for all appropriations for which funds are allocated to Tenth Army.

a/ Data for each installation include funds for subinstallations.
b/ Funds increased $11 million from 30 November 19X1.
c/ An increase of $700,000 has been requested of higher headquarters for activation of two infantry battalions.
d/ Less than $500. Installation to be inactivated.
e/ Includes three District Engineer offices and Wheeler Army Depot.

SOURCE: Status of Allotments and Operating Accounts, RCS ARACO-14.

TABLE: The term used to designate the entire tabular presentation.

BODY: The "tabular" part of the table; excludes the title, headnote, and footnotes.

FIELD: The area within the body of the table in which the figures are entered (excludes the Stub and Boxhead).

PAGES REQUIRED

The space occupied by a table may vary from less than one page to many pages. Tables requiring one page or less are called single-page tables. Those taking up more room are termed multipage tables.

Single-Page Table

Sometimes a table is a little too long, or a little too wide, or both, to fit in the space available on a page. This problem usually may be solved by changing the internal structure of the table or a careful pruning to make it smaller. For example, blank space may be eliminated or abbreviations may be used to make the table fit. (See "Unusual Spacing Problems," page 40.)

Multipage Table

When the boxhead of a table fits across a single page, but the stub is much too long, the stub can be continued on one or more additional pages. The title and column headings are repeated on each page of an upright table and on the left-hand pages of a broadside table.

Titles for multipage tables are discussed on page 22.

Double-Page Spread Table

When an upright table is much too wide for the page width, it can often be placed on two facing pages with about half of the column headings on each page. If there is enough room, repeat the entire stub on the right side of the right-hand page. Otherwise, use line numbers in lieu of the second stub. If the stub captions are numerous, continue the stub on one or more sets of facing pages and repeat the title and column headings on each set.

The title should not be centered across the two facing pages, but should appear separately on each page.

Double-page spread tables should be avoided as a general rule but they are always preferable to extra-sized "fold-in" tables, which are not recommended under any circumstances. Fold-ins are expensive, they tear easily, and they are exceedingly hard to read with speed and accuracy.

INTERNAL STRUCTURE

Most tables fit into one of three primary patterns as determined by the organization of the stub and the boxhead:

1. Single stub and single boxhead.
2. Divided stub and repeated boxhead.
3. Repeated stub and divided boxhead.

Two secondary forms using field spanners are derived from these basic types, as is another form consisting of two or more subtables. These six primary and secondary types are discussed below and are illustrated on the pages that follow.

The primary considerations in selecting the appropriate type of table are the data relationships which the table is intended to display and emphasize.

The available space on a page and the space requirements of a table are often major factors in selecting the type of table to be used. The table may be long and narrow and the available space short and wide, or vice versa. Sometimes the table may be too wide and too long to fit the page in either direction.

Usually, these conflicts can be resolved by using a structural type which can be adjusted to fit the space. For example, a long, narrow table can be shortened to fit the available height on a page by dividing the stub and repeating the boxhead to produce a shorter, broader table. Similarly, a short, broad table can be narrowed to fit the available width on a page by dividing the boxhead and repeating the stub to produce a longer, narrower table.

Single Stub and Single Boxhead Table

This tabular pattern has a single stub under a single stub heading at the left of the table and a single boxhead across the top of the table. The stub applies across the entire width of the field and the boxhead down the entire depth of the field.

The table may have both a stub and boxhead which are simple (no repeating segments), as in Table 1A on page 16. But it may have a compound stub (repeated line captions under different group captions), a compound boxhead (repeated column headings under different spanner headings), or both as in Table 1B.

The single stub and single boxhead table is the most commonly used and the easiest to prepare and understand. Characteristics of data and inadequate space on the page for the table are the major reasons for selecting some other type.

Before changing from this basic pattern, determine whether the table can be placed in the available space by reversing the positions of the stub and the boxhead. For example, a table with more stub captions than column headings can be turned around and made shorter and wider; or a table too wide for the width of the page but with a short stub can be made longer and narrower.

Divided Stub and Repeated Boxhead Table

In this type of table, the stub is divided into two or more parallel columns with the stub heading repeated above the second and any subsequent columns, and the boxhead across the top of the table repeated for each division of the field preceding the next stub division, and each column heading applies down the entire depth of each field.

Either or both the divided stub and the repeated boxhead may be simple or compound. Each is simple in Table 2A, and compound in Table 2B, on the adjacent page.

A single stub and single boxhead table is a candidate for conversion to the divided stub and repeated boxhead structural type, if it meets

(1A) SINGLE STUB AND SINGLE BOXHEAD TABLE
With Simple Stub and Boxhead

Month	Total	Enlistments	Reenlistments	Inductions
TOTAL .	158,364	53,205	32,862	72,297
July . . .	10,096	3,428	1,954	4,714
August . .	9,324	3,170	1,772	4,382
September .				
October . .				
November .				
December .				
January . .				
February .				
March . . .				
April . . .				
May				
June . . .				

(1B) SINGLE STUB AND SINGLE BOXHEAD TABLE
With Compound Stub and Boxhead

Installation	May		June	
	Received	Adopted	Received	Adopted
TOTAL	1,392	109	1,488	193
CIVILIAN	894	75	925	131
Camp X	81	13	75	8
Camp Y				
Fort A				
Fort B				
Fort C				
Other				
MILITARY				
Camp X				
Camp Y				
Fort A				
Fort B				
Fort C				
Other				

(2A) DIVIDED STUB AND REPEATED BOXHEAD TABLE
With Simple Stub and Boxhead

Type of Complaint	Total	Justified	Type of Complaint	Total	Justified
TOTAL	1,065	354	Grade	21	7
			Indebtedness	9	4
Administration	115	60	Insurance	4	0
Allegations - Report of Conditions	158	35	Leave and Pass	30	9
Allotments			Marriage		
Army Reserve Matters					
			Mess and Food		
Boards			Pay and Allowances		
Denial of Permission to See IG . .			Post Exchange		
Disciplinary Matters			Property		
Discrimination			Quarters		
Duties			Transfers		
Efficiency and Character Ratings .			Schools		
Enlistments			Services and Supply		
Enlistment Promises			All Other		

(2B) DIVIDED STUB AND REPEATED BOXHEAD TABLE
With Compound Stub and Boxhead

Grade in which Serving	May		June		Grade in which Serving	May		June	
	RA	Other	RA	Other		RA	Other	RA	Other
MALE	19,895	49,372	20,846	40,851	FEMALE . .	1,547	3,467	1,486	2,722
General Officer .	301	13	298	12	General Officer	0	0	0	0
Colonel	2,904	247	2,564	204	Colonel	3	1	3	0
Lt. Colonel . . .	5,590	2,518	5,565	2,124	Lt. Colonel . .	34	4	34	2
Major					Major				
Captain					Captain				
1st Lieutenant .					1st Lieutenant				
2nd Lieutenant .					2nd Lieutenant				

(3A)

REPEATED STUB AND DIVIDED BOXHEAD TABLE
With Compound Stub and Boxhead

End of Month	Total			United States					
				Total			Departmental Service		
	Total Employees	Veterans		Total Employees	Veterans		Total Employees	Veterans	
		Number	Percent		Number	Percent		Number	Percent
19X1									
March	601,450	228,617	38.0	471,745	217,485	46.1	16,773	5,081	30.3
June	570,295	220,111	38.6	451,870	209,218	46.3	16,472	4,971	30.2
September	552,829	213,793	38.7	432,988	203,268	46.9	16,085	4,907	30.5
December									
19X2									
March									
June									
September									
December									

End of Month	United States (Concluded)			Outside United States		
	Field Service					
	Total Employees	Veterans		Total Employees	Veterans	
		Number	Percent		Number	Percent
19X1						
March	454,972	212,404	46.7	129,705	11,132	8.6
June	435,398	204,247	46.9	118,425	10,893	9.2
September	416,903	198,361	47.6	119,841	10,525	8.8
December						
19X2						
March						
June						
September						
December						

(3B)

REPEATED STUB AND DIVIDED BOXHEAD TABLE
With Simple Stub and Boxhead

State	Number of Units		Strength
	Allotted	Activated	
TOTAL	718	696	77,688
Arizona	32	32	4,192
California	338	329	37,231
Idaho			
Montana			
Nevada			
Oregon			
Utah			
Washington			

State	Advisor Personnel			Strength per Advisor
	Total	Officers	Enlisted	
TOTAL	414	183	231	188
Arizona	19	10	9	221
California	193	85	108	193
Idaho				
Montana				
Nevada				
Oregon				
Utah				
Washington				

(4)

REPEATED STUB AND SINGLE BOXHEAD TABLE
WITH FIELD SPANNERS
With Simple Stub and Compound Boxhead

Accident Category	June		July	
	Number	Percent of Total	Number	Percent of Total
	Accidents			
TOTAL	2,509	100.0	1,897	100.0
Army Aircraft	6	0.2	3	0.2
Motor Vehicle	1,322	52.7	1,044	55.0
Army	1,048	41.8	812	42.8
Non-Army				
Army Fire				
Other				
	Injuries			
TOTAL	1,594	100.0	1,137	100.0
Army Aircraft	0	0.0	0	0.0
Motor Vehicle	410	25.7	332	29.2
Army	51	3.2	40	3.5
Non-Army				
Army Fire				
Other				

(5) REPEATED STUB AND REPEATED BOXHEAD TABLE WITH FIELD SPANNERS
With Simple Stub and Boxhead

Army Depot	FY 19X1	FY 19X2	FY 19X3	FY 19X4	FY 19X1	FY 19X2	FY 19X3	FY 19X4
	Received				Total Processed			
TOTAL	516,773	649,926	441,122	311,842	508,569	657,535	438,240	311,515
Atlanta	29,361	44,411	24,516	20,818	28,586	44,723	24,379	21,255
Columbus	69,945	99,545	59,431	36,079	69,540	99,769	59,440	35,090
Letterkenny								
Memphis								
Red River								
Sharpe								
Schenectady								
Utah								
	Processed in Less Than Four Days				On Hand at End of Fiscal Year			
TOTAL	457,930	569,074	398,704	270,322	9,913	2,304	5,186	5,513
Atlanta	24,561	33,987	19,708	20,129	775	463	600	163
Columbus	68,180	97,746	56,860	31,275	428	204	195	1,184
Letterkenny								
Memphis								
Red River								
Sharpe								
Schenectady								
Utah								

SINGLE BOXHEAD SUBTABLES
With Compound Stub and Simple Boxhead

(6A) UNITED STATES

Component and Type of Personnel	Total	Male	Female
TOTAL	617,402	608,140	9,262
Regular Army . . .	277,831	270,495	7,336
Commissioned Officers	14,015	12,999	1,016
Warrant Officers . .			
Enlisted Personnel .			
Other Components .			
Commissioned Officers			
Warrant Officers . .			
Enlisted Personnel .			

OUTSIDE UNITED STATES

TOTAL	362,863	359,597	3,266
Regular Army . . .	272,807	271,044	1,763
Commissioned Officers	8,839	8,328	1,016
Warrant Officers . .			
Enlisted Personnel .			
Other Components .			
Commissioned Officers			
Warrant Officers . .			
Enlisted Personnel .			

MUTIPLE BOXHEAD SUBTABLES
With Simple Stub and Boxhead

(6B) ARMY MILITARY PERSONNEL

30 June	Total	Comm Officers	Warrant Officers	Enlisted
19X1	817,430	79,943	8,448	729,039
19X2	829,678	81,126	8,637	739,915
19X3	873,345	82,607	9,274	781,464
19X4				
19X5				
19X6				
19X7				
19X8				

ARMY CIVILIAN PERSONNEL

30 June	Total	Salaried	Wage Board
19X1	272,477	144,412	128,065
19X2	291,508	151,584	139,924
19X3	323,018	164,739	158,279
19X4			
19X5			
19X6			
19X7			
19X8			

certain conditions. These include the following:

1. Too long for the available space and there is enough width to divide the stub and repeat the boxhead.

2. Awkward in appearance because of a combination of many stub captions and few column headings.

Tables with a narrow stub and one or two data columns will often fit in a half page width even after dividing the stub into two columns. Those with more column headings or long headings or stub captions generally require a full page.

Repeated Stub and Divided Boxhead Table

This arrangement puts the data on two or more decks or levels. The entire stub, including the stub heading, is repeated on each deck, and the boxhead is divided with a portion on each deck. The stub applies across the width of the field, but the portion of the boxhead on each deck affects only the entries on that level. The bottom horizontal ruling of each level is drawn across the entire width of the table, and becomes the upper horizontal ruling of the succeeding deck.

Both the stub and the boxhead may be simple (Table 3B on page 17), or compound (Table 3A), or one may be simple and the other compound.

Tables that are too wide for the available space may be rearranged into longer and narrower tables of this general type. For example, short tables that are more than a full page wide may often be converted into longer tables that will fit the width of the page. A double-page spread table or two or more smaller, separate tables is often preferable to this complex type.

Repeated Stub and Single Boxhead Table

The data for this table form are also shown on two or more decks. The stub - except the stub heading - is repeated on each level. The boxhead is common to all levels and appears only once - at the top of the table. The stub and the boxhead may be simple or compound; as illustrated in Table 4 on page 17, the stub is simple and the boxhead compound.

Above each deck is a field spanner qualifying the columns of figures on that level. The first one is placed just below the boxhead. Horizontal rulings drawn the full width of the field inclose each field spanner.

Tables that are short and wide may be converted to those with a repeated stub and a single boxhead. The same result can be obtained by changing field spanners to stub group captions. This avoids cluttering the field of the table with captions. Field spanners are practical, however, for sharp emphasis on the major groupings, or when the number of subcategories of data is so large that the stub otherwise would be complex and hard to follow.

A further discussion of field spanners appears on page 31 and additional examples are on page 33.

Repeated Stub and Repeated Boxhead Table

This arrangement is similar to the preceding type except that the boxhead is repeated across the top and each level has the same number of field spanners (usually two or three) as the boxhead has repetitions (Table 5 on page 18).

Its use is recommended when there is insufficient room for:

1. A longer stub column by conversion to a single stub and single boxhead table (i.e. by shifting the field spanners to the stub and repeating the line captions under each in a single elongated stub column).

2. Additional stub columns by conversion to a divided stub and repeated boxhead table (i.e., shifting the field spanners to the stub, repeating the line captions under each, and dividing the stub into two or more columns).

3. Repeating the column headings of the boxhead under each field spanner by conversion to a repeated stub and divided boxhead table (i.e., changing the field spanners to spanner headings and repeating the column headings under each).

Subtables

The basic and secondary tabular patterns are sometimes changed into a hybrid table form with the data grouped into two or more separate subtables under a common title. Stub group captions, boxhead spanner headings, or field spanners are converted to subtitles which are placed on the second line above the top horizontal ruling of the subtables they describe.

A table-wide horizontal ruling is drawn beneath each subtable. This ruling is separated from the subtitle below it by one or two blank typewriter lines. The standard is one line for half-page-wide tables and two lines for full-page-wide tables (this may be reduced to one if the space is "tight").

The boxhead is shown only at the top of the first subtable when it is applicable to all of the subtables (Table 6A on page 18). Otherwise, each subtable has its own boxhead (Table 6B). The stub is repeated for each subtable, but the stub heading is repeated only if each subtable has a separate boxhead.

Subtables focus attention on major groupings of related data. Do not use them when such emphasis is not needed.

COMPONENT PARTS OF A TABLE

The terms used in this chapter to designate the component parts of a table are illustrated on page 14. The main parts of a table are: the title, stub, boxhead, field, and notes. These are discussed in some detail in the following sections. Line numbers and column numbers are not shown in the illustration, since they are used only in large detailed tables or when references to specific entries are anticipated. The principal components of tables are discussed and illustrated on the pages that follow.

THE TITLE

Every formal table should have a title stating briefly the nature of the data presented. This should be a concise, explicit statement covering the following:

1. Subject - the title should indicate the basic content of the table. Examples:
   Military Strength
   Civilian Employees
   Procurement Deliveries
   Depot Receipts

2. Coverage - it should indicate whether the data cover the whole subject (e.g., Strength of the Army) or only a portion of it (Fifth Army Strength). It is to be assumed that an entire universe is covered unless some kind of a limitation is indicated.

3. Cross-classification - the title should indicate how the data are classified and cross-classified. Only major cross-classifications should be indicated in the title, with detailed classifications indicated in the stub and in the boxhead. The cross-classification usually follows the subject and coverage segments of the title, and is preceded by the word "By." The cross-classification is usually expressed in the singular rather than the plural form. Examples:
   By Branch and Grade
   By Type of Vehicle
   By Month and Type of Personnel

4. Time - if applicable, the title should indicate the date(s) or time period(s) to which the data refer. This may be a specific date(s) or time period(s), selected dates, or inclusive period(s) of time. Examples:
   30 June 19X6
   30 June and 30 September 19X6
   30 June 19X4 and 19X5
   Fiscal Year 19X7
   Calendar Year 19X2
   Selected Dates, 19X5, 19X6, and 19X7
   June 19X4 - July 19X6

The table title thus serves two functions: it indicates the contents of the table and at the same time it serves as a reference guide. A single title may be used when a short, simple statement is sufficient to describe the data in the table or the title may consist of a main title and a subtitle, to simplify an otherwise long, complex title or to indicate variations in content of a series of related tables.

Wording of Titles

Titles should be brief, but neither clarity nor accuracy should be sacrificed for brevity. The wording of titles should be in topical form (telegraphic style) rather than sentence form. Verbs are usually omitted as well as articles or other parts of speech not needed to understand the title. Some other ways of obtaining brevity are to make the terminology concise and to use subtitles, headnotes (page 34), and footnotes (page 35).

The contents of the table should never be less than that described by the title, but the table can contain more detail than the title indicates. Generally, a short, less complete title which may be read easily is preferred to a long, complete title which may not be read thoroughly because of length or complexity. It is often desirable to rely on footnotes or explanatory notes for complete statements of content and coverage.

Abbreviations should be used sparingly in titles and only when they are standard and widely accepted. Terminology should be standard and consistent among tables within the same report, and among related reports.

Phrases like "Table Showing," "Number of," and "Distribution of" should be omitted from titles when the meaning is clear without them.

Single or main titles which require two or (rarely) more lines, should be broken at logical points in order to make them easier to read and understand. The division of words should be avoided.

Emphasis in Titles

Emphasis should be placed on the principal feature that distinguishes a table from other tables. Sometimes this can be done by placing the most important word or phrase first. When tables concerning entirely different subjects appear in the same volume, the subject should be emphasized. In related tables, the emphasis should be placed on the distinguishing feature, whether it is the main subject or not.

Subtitles

Subtitles are used to amplify the main title when necessary. They are particularly useful to indicate the time to which the data refer and to delineate differences in the content of related tables by indicating such things as the command, area, or population group covered.

Dates in Titles

Dates may be omitted from titles if they are the same for all of the tables in a report or section of a report, and the time is clearly identified on the cover of the report or on the title page or running head of the section. If the dates vary among the tables of a report or a section of the report, the appropriate date(s) should be included in the title of each table.

When dates are used in titles, they usually should be placed after that portion of the title to which they apply. If they apply to the entire table, they should be placed at the end of the title or in a subtitle. When different dates apply to different portions of the title, each segment of the title should be followed by the applicable date(s).

Specify exact dates in the table title or subtitle only where it is impractical to show them elsewhere, or where the statistics might otherwise be misinterpreted. The precise time specification can often be indicated logically

in the stub heading or in a spanner heading of the boxhead. For example, the shorter title "STRENGTH OF THE ARMY: 1910 - 1925" is preferred to "STRENGTH OF THE ARMY: 30 June, 1910 - 1925" when the month and day can be placed in the stub heading. However, use "STRENGTH OF THE ARMY: 30 June 19X4" instead of "STRENGTH OF THE ARMY: 19X4," or "STRENGTH OF THE ARMY: June 19X4," since it would be awkward to show the precise "as of" date elsewhere and misleading unless the exact date is clearly indicated.

When a table presents calendar year data, the time specification should generally consist of the year designation(s) only. When fiscal year data are indicated, the year designation(s) should be preceded by the words "Fiscal Year." Do not use "Fiscal Year 19X4" if "30 June 19X4" is meant. Unless the day and month are indicated in tables pertaining to numbers of personnel for example, doubt arises as to whether the data cover manyears or fiscal year-end strength. In reports where both fiscal and calendar year data appear, it is important to describe in figures in order to avoid confusion.

When time series data cover a continuous period, the inclusive dates should be shown in the title, e.g., April 19X4 - December 19X6 (but if the data are for the end of each month, this fact can be shown in the stub or spanner heading, as appropriate). When time series data omit some of the intervening regular periods or dates, or cover irregular dates or periods, the dates or periods may be preceded by a phrase such as "For Selected Periods," "For Selected Months," "For Specified Years," "For Specified Dates," or "For Selected Years, 1900 - 1980").

Use of such terms "During" and "Between" with dates should generally be avoided unless there is some special reason for including them.

Percentages, Rates, and Ratios in Titles

Frequently statistical tables are comprised of or contain percentages, rates, and ratios to facilitate analysis of data. When a table consists solely of such measures, that fact should be indicated in the title. When a table contains both absolute and relative numbers, the content of the title depends on the purpose of the table:

1. If the primary reason for the table is to highlight the relative figures, and the absolute numbers are of secondary importance, limit the title to a description of the relatives.
2. If the absolute numbers are of primary significance, and the relatives are of secondary interest, omit reference to the relatives.
3. If they are of equal importance for the use and interpretation of the data, indicate in the title that both the absolute and relative numbers are contained in the table.

Percentages - the title should make clear whether each sub-group is expressed as a percent of the total population group covered by the table, or whether only one or a few of the sub-groups have been selected to be expressed as a percent of the total population. Example:

OFFICERS AS A PERCENT OF TOTAL MILITARY STRENGTH

Rates - some of the descriptive information about rates may be included in a title or subtitle. Example:

ADMISSION RATES TO HOSPITALS AND QUARTERS
Admissions per 1,000 Average Strength per Year

The complete information which should be covered somewhere in the report is specified in Army Regulations 325-10, Standard Computation of Rates, Paragraph 8. Sometimes this information is so voluminous that it should be presented in headnotes, footnotes, boxheads, or a combination of these.

Ratios - usually the title should omit the phrase "Ratio of." Instead, it should clearly indicate which group is being expressed in relation to the other. Examples:

NUMBER OF TRAINEES PER TRAINER

NUMBER OF CIVILIAN EMPLOYEES PER SUPERVISOR

In addition, as indicated above for rates, the title may indicate the size of any standard unit of population adopted.

Placement and Capitalization of Titles

Typewritten titles should be placed at the top of the table, and centered across the width of the table. Main titles containing two lines should be presented in an inverted pyramid form. Subtitles should generally be centered directly under the main title. Normally one blank line should be left between the title and the upper horizontal ruling of the boxhead.

Main titles should be typed in ALL CAPITAL LETTERS. Subtitles should be typed in Initial Capitals only.

Punctuation in Titles

The following punctuation rules should be followed in table titles to obtain clarity:

Comma - use to separate three or more subjects, coverage indicators, cross-classifications, or dates, with the last in each series preceded by "and." Also use them to separate the subject and coverage segments from the cross-classification segment when they appear on the same line. In multiline titles, do not use a comma at the end of a line when the following line begins with a cross-classification or when it is a subtitle.

Colon - use to precede the time indicator when it appears at the end of the title. Do not use a colon when time is indicated as a subtitle.

Semi-colon - use between series of dates when dates within one series are separated by commas.

Hyphen - use to separate dates when the entire period shown by the dates is covered in the table, or when data for each date or time period covered by the time indicator are shown in the table. Use the word "and" in lieu of a hyphen to separate two dates or time periods, and three non-consecutive dates or time periods.

Examples are given below:

7 December 1941 - 31 August 1945
Fiscal Years 1965 - 1975
April and May 1942
April, June, and November 1917

Titles for Multipage Tables

When an upright table covers more than one page, each page should contain the full title, and any accompanying headnote if applicable. The indication "(Continued)" should be placed at the end of the title on all but the first and last pages; the last page should have "(Concluded)" at the end of the title.

When a broadside table takes more than one page, the title, modified as explained above with "(Continued)" and "(Concluded)", should appear on the first page, on each succeeding left-hand page, and the last page.

Table Numbers in Titles

Table numbers are not an integral part of a formal table and therefore are not a "must" for statistical tables. This is particularly true for reports containing only one table or a very few tables. When a report contains many tables, however, a numbering system is generally used to facilitate references and identifications in the body of the report and in a list of tables.

When numbers are used in titles, the standard practice is to precede the number with the word "Table" and place them to the left of the title as follows:

TABLE 8 - NEW OBLIGATIONAL AUTHORITY
FOR MILITARY FUNCTIONS

Several methods may be followed when making assignments of table numbers or letters in a statistical report. Either numerals, or letters or some combination of both of these may be used. A system that is good for one report may not be good for another. The choice depends upon the size and the nature of the report, the number of tables, and the complexity of the subject matter. Approved methods are:

1. Use Arabic numerals throughout the report, numbering each formal table in sequence, starting with the first summary or analytical table and ending with the last reference table.

2. Use capital letters for summary or analytical tables and Arabic numerals for reference tables, when these two table types are clearly distinguished.

3. Use capital letter prefixes with Arabic numerals where a large report contains several chapters or sections on different subjects. The single capital letter prefixes may consist of a letter, or two letters keyed to the subject matters. Examples: A-1, A-2 . . , B-1 . . . ., etc.; MP-1 for the first table on military personnel, CP-1 for the first on Civilian Personnel and PD-1 for the first on Procurement Deliveries.

Roman numerals are not recommended since they are easily misread and it is difficult to refer to them.

THE STUB

The list of captions at the left side of a table is called the Stub. These captions describe each row of figures.

Where only a part of the stub is listed on one page and it is continued on the next page, the continuation is also placed on the left of that page.

A table requiring two facing pages to show all data columns applicable to the stub should have a duplicate stub on the right side of the right-hand page. Line numbers may be used in lieu of the second stub if space precludes this listing on the right-hand page. This type of table is called a "double-page spread."

Every stub should have a heading. The stub heading is used to describe, define, or amplify stub captions. Care should be used in determining this heading. Examples: 30 June, Month-end; Calendar Year, Fiscal Year; Destination, Origin; Grade in which Serving, Permanent Grade; Category and Location; Category and Status; Army and Army Area.

Designing a Stub

A poorly designed stub is hard to understand and use. Extra care spent on the design of the stub sometimes makes the difference between a good table and a poor one.

To design a good stub, carefully organize the items selected to be included in it and show this organization clearly. Organization means putting the parts in a useful order and grouping them in a logical way to emphasize the kinds of comparisons which are appropriate for the data, and its expected use.

Organizing the Stub

The first step in arranging a stub is to decide on the order of the items. The order is important because it helps the reader to make significant comparisons and it also helps him to find individual figures quickly.

Order is not necessarily the same thing as classification. Data classified geographically- such as command strength, by state - need not be in geographical order: the order could be alphabetical, in order of size, etc. Sometimes the kind of classification fixes the order - as in data classified by time of occurrence - but not always.

Useful Arrangements of Items in the Stub

The following list explains some of the reasons why one order may be better than another. The first five are mainly arrangements for convenience; and the second five are primarily arrangements for analysis. (See illustrations page 25.)

1. ALPHABETICAL - in order of the names of the items (dictionary order, telephone lists, etc.).

2. NUMERICAL - the order in which the stub items are numbered (program numbers, unit numbers, Armies, etc.).

(The numerical order as well as the alphabetical order are frequently used when it is important to locate individual items quickly. These arrangements are particularly useful for long stubs.

3. QUANTITATIVE - the order of the size of the items (1/4-ton, 3/4-ton, 1 1/2-ton, etc.; under 6 years of age, 7-8, 9-10, etc.; 40-mm, 57-mm, 75-mm, etc.).

   The order of smallest to largest item (or largest to smallest). This is often a customary or convenient way to list things.

4. GEOGRAPHICAL - the order fixed by geographical location (Maine, New Hampshire, Vermont, etc.; Continental U.S. Outside Continental U.S.; etc.).

   This can be used simply because it is customary and so helps the reader to find items quickly. It is very useful to show how things differ from one location to another. This sequence is best when the location names can be put in an order that suggests their actual geographic arrangement. Within major geographical areas, however, individual states or countries can be listed alphabetically for convenience.

5. CUSTOMARY - the order that has come to be accepted (salaried and wage board; commissioned officers, warrant officers, enlisted personnel; etc.).

   This is generally used for short lists of items only. Like the four preceding arrangements, it is useful when it is important not to take a new point of view.

6. CHRONOLOGICAL - the order of the dates at which the items occurred (Apr, May, Jun; 1st quarter, 2nd quarter, 3rd quarter; etc.).

   This may be used to show growth, trend, or change. It is one of the most valuable analytical arrangements.

7. FREQUENCY - the order of how many there are of each item. This is not the same arrangement as shown in (3) above which depicts order of size of items. Size measures how big the items are; frequency measures how many, or how much there is of each item.

   To illustrate: stub listing of vehicles in the order 1/4-ton, 3/4-ton, and 1 1/2-ton would be by order of size of items. However, if we had 200 of the 1/4-ton, 50 of the 3/4-ton, and 500 of the 1 1/2-ton vehicles and wished to list them in a frequency arrangement, we would list the 1 1/2-ton, 1/4 ton, and 3/4-ton vehicles in that order.

8. PROGRESSIVE - the order of development of growth (feasibility study, research and development, pre-production, procurement, maintenance, etc.).

   This is good for showing how the status at a starting point changed to reach the status at an ending point. It is also useful for showing how many items have reached each stage of progress towards completion.

9. IMPORTANCE - The order of rank or grade (top third in performance, middle third, bottom third; Col, Lt Col, Maj, Capt, 1st Lt, 2nd Lt; etc.).

   This is useful for comparing rank, seniority, results, quality or performance.

   Sometimes, putting a list in one order puts it in another too: order of size could be the order of importance and also the customary order; order of location could also be the progressive order. When this happens, the question of which order to use is much easier to decide.

   Two or three different kinds of order may be used in the same stub. For example, the main order of stub items in a strength table might be geographical, with each geographical unit divided to show a major unit arrangement and each of these units divided to show a customary (officer and enlisted) listing.

Organizing a Complex Stub

Many stubs are not just a straight list of items. Organizing the stub is seldom that simple and easy.

Some stub lists have two or three main item groups with many items under each; conversely, some have many main groups with two or three items under each. Usually, these are simple patterns that are fairly easy to work out.

The difficult ones are the stubs that have an irregular pattern: For example, a long list of major groups; some with a few minor groups, some with many, and some with none. When a list like this has two or three levels of captions, the problem becomes more difficult.

There is no simple way of designing a complex stub; but these rules will help:

1. Make the major divisions clear: let the reader see at a glance what the main components are.

2. Set off major items: whether single items or groups of items, those at the first level should stand out clearly.

3. Group related things: items that are related, even though some may be major, and some minor, should be set apart from other items.

4. Make subordinate levels look subordinate: each step of subordination should be easy to see and to identify.

5. Split long lists for easy reading: a list of items all at the same level of importance is hard to read unless split into groups.

6. Use clear, accurate wording: make it clear to the reader exactly what each item means (what is included in it and what is not). This applies especially to totals and sub-totals.

Some of the standard stub arrangements on page 25 illustrate these rules. Other tables in this chapter show possible solutions to several other stub problems.

A special "double stub" arrangement can be used when the stub contains both captions and units of measurement (see "Units of Measurement in the Boxhead," page 31). This arrangement is of value when all or most of the lines require separate and distinct units of measurement. The two parts of the stub are usually separated by a vertical ruling as in the example below.

Item	Unit	Jan	Feb	Mar
Acid, Nitric	1-Lb. Bottle			
Boots, Jungle	Pair			
Concertina Wire, Barbed	Roll			
Crossties	Thous. Pieces			
Cup, Canteen	Thousand			
Lumber	Thous. Bd. Ft.			
Repellent Insecticide	Gallon			
Soap, Soft	25-Lb. Drum			

Making the Organization Clear

In a standard typewritten table four things may be done to make the organization of the stub clear: capitalize, indent, space, and underline. Other things such as boldface type, larger or smaller type sizes, and italics are not found on standard typewriters, and therefore relationships must be established without them.

Using Capital Letters in the Stub

Three degrees of capitalization can be made with a typewriter:

ALL CAPITALS: EVERY LETTER A CAPITAL LETTER

Initial Capitals: Every word except Prepositions, Articles, and Conjunctions start with a Capital Letter. This is also called Capitals and Lower Case.

Normal Text Capitalization: Use no capitals except for the first letter of the first word and of all proper nouns.

ALL CAPITALS should be used only for totals, and for captions of major groups.

Initial Capitals should be used for captions of minor groups or for items under major groups when there are no minor groups. They may also be used for subtotals in short, simple tabbles, or where each major group has only a few items under it.

Normal Text Capitalization should be used only for items under minor groups.

The use of lower case only is generally limited to an explanation in parentheses that accompanies a caption. (This is rare: a footnote is often better).

The illustrations on this page and on other pages in this section show how to apply these rules. In addition they show how the rules may be modified to meet special problems without diminishing the clarity of the table.

Indention

Use as much indention as needed to set off each step of subordination - but no more. Generally, two typewriter spaces for each step is enough. The standards of indention which are established in this pamphlet are:

TOTALS - indented four spaces - start in the fifth space.

MAJOR ITEMS - no indention (all the way out to the left edge of the table).

SUBORDINATE ITEMS - Indented two spaces - start in the third space (each step of subordination is indented two more spaces).

Note: If a caption runs to two lines, the second line is normally indented two spaces more than the first; four spaces if followed by subordinate items which are indented two spaces more than the first line.

Sometimes the stub classification is so unusual that this system will not work. For example, the line captions may be longer than the group captions, in which case the order of indention should be reversed to save space. The illustration on page 31 shows an example of this problem and how to handle it.

Vertical Spacing

Additional space is the standard device for setting off the main components of the stub. The normal spacing (up and down) is:

ONE BLANK LINE (double spacing) between: totals, and the items they summarize; two major items; or a major item and its component parts.

NO BLANK LINE (single spacing) between: the items in a group, or a list of items not grouped under major headings.

A long list of items, however, may be split by using "space" breaks (one blank line) between each 3, 4, 5, or sometimes more items, depending on the number of items, and the amount of space available.

Changing the Normal Stub Spacing

Normal spacing should be used in all tables when space is not a limiting factor; when space is tight, or too plentiful, normal spacing must be shrunk or stretched. Where possible, try to use the same spacing scheme for a series of tables with the same stub or similar stubs.

(1) This stub lists officer grades in the customary order of highest first (also the order of importance). Since there are no group headings, no indention is used except for the total. No space-breaks (blank lines) are needed between each group of three items in a short list like this, but may be used if desired.

TOTAL . . . . .
General . . . . .
Colonel . . . . .
Lt Colonel . . . .
Major . . . . .
Captain . . . . .
1st Lieutenant . .
2nd Lieutenant . .
Warrant Officer . .

(2) This short stub is similar to the one at the left except that officers have been grouped under grade headings. The grouping is emphasized by retaining the normal space between groups, but substituting an underline for the space normally used to separate the group headings and the items under them.

TOTAL . . . . .
General . . . . .
Field Grade . . . .
Colonel . . . . .
Lt Colonel . . .
Major . . . . .
Company Grade . . .
Captain . . . . .

(3) A typical arrangement for showing time captions in the stub. It follows the standard order of earliest date first. Note that yearly data are separated by blank lines, monthly data typed "solid"; also that monthly captions are indented two steps in from the outside edge.

FISCAL YEAR 19X1 .
FISCAL YEAR 19X2 .
FISCAL YEAR 19X3 .
1st Quarter . . .
July . . . . .
August . . . .
September . . .

(4) A simple arrangement for showing status of supply. Note that all of the items are given equal emphasis and that there is a blank line after each one. Changes during the period receive the same emphasis as the status at its beginning and end.

On Hand 1 April
Received in April
Shipped in April
On Hand 30 April

(5) An illustration of items put in an analytical arrangement (like things grouped together) but listed for convenience (alphabetical order within each group). The blank line between groups is the standard method of separation and should be used when there is plenty of room.

TOTAL . . . . .
Fort Allen . . . .
Fort Gates . . . .
Fort Montgomery . .
Fort Schuyler . . .
Camp Clark . . . .
Camp Greene . . . .
Camp Putnam . . . .
Others . . . . .

(6) Part of a long stub contains two types of classifications (by fort and by type of personnel). In this arrangement the first comparison is between military and civilian at each fort. Note use of capitals and two-space indention for the two subtotals under the grand total.

TOTAL . . . . .
MILITARY . . . .
CIVILIAN . . . .
Fort Able . . . . .
Military . . . .
Civilian . . . .
Fort Baker . . . .
Military . . . .
Civilian . . . .

(7) Part of a long stub in which items first are classified by location then by nature of the violation. Second classification is shown in order of frequency. "Space breaks" could be used in the list of violations but are not actually needed in such a short stub.

VIOLATIONS . .
TENTH ARMY . . . .
Drunk . . . . .
Disorderly . . .
Pass Offenses . .
Off Limits . . .
Vehicle Offenses
Uniform Offenses
Others . . . . .

(8) This stub shows three levels of subordination. Note the indention for each level and the use of underlining.

When items in the stub are underlined all corresponding entries in the field should also be underlined.

TOTAL AREA . .
COVERED . . . . .
Warehouse . . . .
Occupied . . .
Vacant . . . .
Non-storage . .
Shed . . . . .
Occupied . . .
Vacant . . . .
Non-storage . .

(9) Two stubs having the same captions - but arranged differently. The first is an analytical arrangement (in order of the quantity of each item); the second is a convenience or customary arrangement (in order of the size of the item). The first form is better for short analytical tables; the second, for long lists in which ease of locating an item is most important.

TOTAL . .	
Trucks . . .	965
2 1/2-Ton .	430
1/4-Ton . .	315
3/4-Ton . .	220

TOTAL . .	
Trucks . . .	965
1/4-Ton . .	315
3/4-Ton . .	220
2 1/2-Ton .	430

(10) An example of a fairly complex stub that has been shortened as much as possible. Underlines are used to emphasize the total and the subtotals (see page 28). Note that "Army of the U. S." and "Retired Reserve" are not underlined, but that "National Guard," as a minor group is underlined.

TOTAL . . . . .
Active Army . . . .
Regular Army . .
Army Reserve . .
National Guard .
Army of the U. S.
Civilian Components
Army Reserve . .
Ready Reserve .
Standby Reserve
Retired Reserve
National Guard
Civilian Employees
Salaried . . . .
Wage Board . . .

Lengthened Two Steps a/

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

Lengthened One Step

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

NORMAL SPACING

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

a/ See footnote on next page.

ADJUSTING
THE LENGTH
OF A STUB
TO FIT THE
SPACE

Shortened One Step

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

Shortened Two Steps

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

Shortened Three Steps

TOTAL	13,456
MAJOR GROUP . . .	11,797
Minor Group . .	10,306
Item	1
Item	23
Item	456
Item	7,890
Item	12
Item	345
Item	678
Item	901
Minor Group . .	1,391
Item	23
Item	456
Item	789
Item	123
Minor Group . .	100
MAJOR GROUP . . .	45
MAJOR GROUP . . .	1,588
Item	678
Item	910
MAJOR GROUP . . .	26

WHERE TO PUT BLANK LINES IN THE STUB

Lengthened Stub		Normal Spacing	⇩	Shortened Stub		
Two Steps a/	One Step			One Step	Two Steps	Three Steps
1	1	1	Above first stub caption and below last	1	1	1
2	2	1	Below TOTAL b/	1	1	0
2	2	1	Between MAJOR groups	1	1	0
2	2	1	Between MAJOR and minor groups	1	0	0
2	2	1	Between minor groups	1	0	0
1	1	1	Between group headings and their items	0	0	0
1	1	1	Between every four items c/	1	0	0
1	0	0	Between every item	0	0	0

a/ The stub can be made still longer by doubling all normal spacing (putting two blank lines where the normal spacing calls for one, and one where it calls for none); but this third step of stretching makes the table look so empty that it should be used only as a last resort. About the only reason for this much stretching is to fill out a short page in the middle of a long series of full pages.

b/ Above, if total is at the bottom.

c/ Every three in short lists; five or more in long lists.

Sometimes a table may be shrunk or stretched for emphasis. Within reason, the size of a table should be tailored to give it appropriate emphasis.

The illustrations on pages 26 and 27 show normal spacing and some procedures for shrinking or stretching the stub. These changes, however, do not alter the basic system of emphasis and grouping.

Underlines

Underlining should be used in typewritten tables much the same way that boldface type is used in printed tables, to give emphasis to subtotals and totals.

It is not necessary to underscore all subtotals and totals, particularly in small tables with adequate space between lines and for indentations or in unusually complex tables with many subtotals. Each table should be examined to determine whether or not underlining will make it easier to use and understand. When captions are underlined, the figures in the field should also be underlined.

Wording in the Stub

Use captions that are both descriptive and brief. This means to use mostly nouns, and to omit as many articles, prepositions and conjunctions as possible without impairing clarity.

"Total" means the total of all the subordinate items shown in the table. "Total" used as an adjective (total strength, total man hours, etc.) means the total of all there are - whether its components are shown in the table or not. Often ambiguities in the content of totals can be eliminated by substituting "all" for "total", such as "all appropriations" or "all programs." The use of "aggregate" in lieu of "total" generally should be avoided.

Abbreviations may be used in the stub when space is limited, but only those which may be located in authoritative military or civilian sources; such as Hq Co; Inf Div, Mech; Mil Sq Ft etc.

Punctuation in the Stub

Use no more punctuation than needed to make the meaning clear. Some of the rules of punctuation used in text are not followed in stub captions. For example:

Periods are not used at the ends of captions, and may be omitted from abbreviations if the meaning is clear without them. Periods may also be omitted from initials used as shortened names for countries, governmental agencies, and other organized bodies and for some other well established abbreviations such as USSR, USAR, NATO, POW, WAC, and FY.

Do not use apostrophes to show missing letters in words abbreviated by contracting.

Use of Leaders

Leaders (rows of periods in every other typing space) are used to connect each caption with the first data column. They are lined up vertically, working back from the second space before the first vertical ruling, to a point in the second or third space, as appropriate, after the last letter of each caption. In an informal table with no vertical rulings, at least two blank spaces should separate the leaders from the widest figure in the first data column. No leaders should be used in the field of the table.

Do not use leaders (1) in narrow stubs, (2) in wide stubs when the captions end uniformly near the first vertical ruling, (3) in the duplicate stub at the far side of the right hand page of a table on facing pages, or (4) for captions that do not have any field entries opposite them. Always use leaders in wide stubs with short captions or those of irregular length.

Line Numbers

Line numbers are seldom necessary in single page tables. They may be used, however, at the left side of the stub when convenience of reference makes them desirable.

When line numbering is required, all stub captions which identify rows of figures should be numbered consecutively. The numbers are separated from the stub by a vertical ruling. In the page at the right side of a table on facing pages, the ruling is between the last column of figures and the column of line numbers.

If there is not enough room for the second stub of a table on facing pages, use line numbers instead, on the right side of the second page and match these with line numbers at the left side of the stub on the first page.

The use of line numbers is illustrated in the table under "Lettered Columns," on page 31.

Placement of Totals

Total lines are placed above the subordinate numbers of which they are the aggregates. Exceptions may occur in tables dealing with financial data, when conformance with accounting practice is required, but not otherwise. Totals generally are considered to be the most important figures in tables. Placing them at the top helps the reader to see them first.

THE BOXHEAD

This term refers to all the column headings across the top of the table. These headings indicate the kinds of information entered in the stub and field below.

The boxhead is separated from the title by a single horizontal ruling which runs the full width of the table, with one blank line between the title (or the headnote, if any,) and the ruling. It is separated from the first caption in the stub in like manner.

Contents of the Boxhead

The tabular form is based on the relationship of data in two categories, one listed in the stub and the other placed in the boxhead. The category consisting of the fewer items or shorter captions is usually placed in the boxhead, since standard page dimensions provide for

less horizontal space than vertical. Exceptions to this generalization may occur where:

1. Other material presented on the page makes it necessary to have a table that is wider than it is high.

2. The data comparisons to be emphasized require a stub that is short and a wide boxhead.

Arrangement of Columns

The sequence of columns should be in some orderly arrangement, as noted for items in the stub (see pages 22-4). When the same headings are shown in the boxheads of two or more tables, the arrangement and wording should be uniform.

A Total column, if used, is placed to the left of the columns of which it is an aggregate. This applies both to columns which contain subtotals of other columns, and to the column which contains the total of all other columns or subtotals (and thus is the first data column to the right of the stub). Exception: in tables dealing with financial data, when conformance with accounting practice is required, the total columns may be placed on the right of the columns of which they are aggregates.

Derived figures, such as averages, ratios, percentages, changes, and deviations, should usually be placed in columns to the right of the basic figures.

Grouping coordinate column headings under a common heading which describes all the columns beneath it, aids in reading and interpreting tables and shortens the column headings by avoiding unnecessary repetition of words. These group headings are referred to as spanner headings in this manual and they are similar to the group captions in the stub. Spanner headings may also be used to group and describe two or more lower or subordinate spanner headings. The use of spanner headings is illustrated on page 33.

Wording in the Boxhead

Column or spanner headings should always read horizontally. Single words may be hyphenated and placed on two or three lines, as necessary. Headings are typed with initial capitals, except for articles, prepositions, and conjunctions, which are not capitalized.

Brevity is necessary because of space limitations. Standard or otherwise easily understood abbreviations may be used to save space. Use of abbreviations in one column heading does not usually require their use in other column headings of a table. If they pertain to related things, however, such as the states of the United States, the standard is to either abbreviate all or none of them; but not a combination of both.

Punctuation in the Boxhead

The general rules on the punctuation in the stub are also applicable to the boxhead. (See page 28). In addition, if a word normally followed by a comma ends a line of a column heading having two or more lines, the comma may be omitted if clarity is not reduced.

Spacing in the Boxhead

The first example below shows normal vertical and horizontal spacing of column headings. The second shows minimum vertical, and the third maximum recommended vertical spacing.

(1)

Army Command Strength				
Total	By Sex		By Component	
	Male	Female	Regular Army	Other

(2)

Army Command Strength				
Total	By Sex		By Component	
	Male	Female	Regular Army	Other

(3)

Army Command Strength				
Total	By Sex		By Component	
	Male	Female	Regular Army	Other

Vertical - Each column heading should be centered in its box. It should not be lined up at either the top or bottom with other headings which differ in vertical size. In an informal table, however, the bottom line of each column heading is underscored, in which case the bottom lines of all column headings are lined up.

The heading of the box with the most typed lines should generally be centered in a vertical height one typewriter line larger than the number of typed lines in the column heading; that is, leave one-half blank line between the column heading and each of the horizontal rulings, as in the first of the above examples. The other column headings are then centered vertically (up and down) in their respective boxes. In some cases, the half-line blank space allowance may be deleted or stretched to one line. Headings of more than one line should be single spaced.

Horizontal - The widest line in each column heading should be centered in its box, with a minimum of one blank typewriter space on each side. The other lines are also centered. Where there is an extra blank space, or only one blank space, on any line, put it to the right of the typing. Exceptions: put it on the left (1) in the first (or only) line of the last column or spanner heading, (2) in short spanner headings where it will produce better centering of the heading over a vertical ruling, and (3) in lines ending with a hyphen.

Generally if two or more lines are required in the heading, they should be in an inverted pyramid or pyramid form, depending on the length of the words in each line, logical breaks in wording, and necessary hyphenation.

BOXHEAD CONSTRUCTION

Preferred Practice

Centering: Headings should be centered top to bottom in each box . . .

Total	Three Line Heading	Wide-column Heading	Ratio

NOTE: Centered headings are the recommended standard for formal tables. This arrangement follows standard publishing practice. (See the Government Printing Office Style Manual, page 180.) For informal unruled tables, align the headings at the bottom of the deepest heading; center them left to right over the figures in the field below.

Number of Lines: Headings should be put on as few lines as possible . . .

Too fast for Conditions	Improper Turn	Assuming Right of Way

Reading Position: All column headings should read horizontally . . .

Field Grade			Company Grade		
Prog	Auth	Act	Prog	Auth	Act

Field Grade			Company Grade		
Pro-gram	Author-ized	Actual	Pro-gram	Author-ized	Actual

Box Heights: All boxes on the same level should be the same height (determined by deepest box):

Total		Active Duty Military Personnel		All Other	
June	July	June	July	June	July

Location of Totals: "Total" column should be at the left of the columns it totals . . .

Total	Military		Civilian	
	Number	Pct of Total	Number	Pct of Total

Faulty Practice

. . . do not align them at the bottom.

Total	Three Line Heading	Wide-column Heading	Ratio

. . . or at the left,

Total	Three Line Heading	Wide-column Heading	Ratio

. . . or at both bottom and left.

Total	Three Line Heading	Wide-column Heading	Ratio

. . . do not put them on as many lines as possible.

Too Fast for Conditions	Improper Turn	Assuming Right of Way

. . . avoid vertical readings by abbreviating or by splitting words.

Field Grade			Company Grade		
Program	Authorized	Actual	Program	Authorized	Actual

. . . avoid this kind of construction.

Total		Active Duty Military Personnel		All Other	
June	July	June	July	June	July

. . . avoid putting totals at the right (but see "Arrangement of Columns", page 29).

Military		Civilian		Total
Number	Pct of Total	Number	Pct of Total	

Units of Measurement in the Boxhead

Units of measurement that describe the content of the columnar data in the field (e.g., pounds, dollars, percent, etc.), and notations which indicate that the figures have been abbreviated ("000s" or "Thousands") are usually placed in the column or spanner heading if they refer to a single column or group of columns. They are not used in the field, except in field spanners. They are seldom used in the stub, but are properly placed there when the measurement unit changes from line to line.

If a measurement unit or rounding note is applicable to all or most of the data in the table or is too long or clumsy to include in the column headings, preferred placement is in a headnote immediately above the boxhead.

Put units of measurement after or below the captions in column headings and inclose them in parentheses. Make them brief; use clear abbreviations where necessary. Capitalize the initial letter of the first word and use lower case for all other words; for example: "Deliveries (Millions of dollars)," "Area (sq. ft.)," "Ammunition (Thous. rd.)," etc.

Sometimes a unit of measurement comprises an entire column heading caption. If it does, the parentheses are omitted, and initial capitals are used on all words, except the prepositions, articles, and conjunctions; for example: "Percent of Total," "Number per 1,000 Average Strength," etc.

Lettered Columns

Columns seldom require lettering. Tables having many columns, however, and especially those occupying facing pages, occasionally have lettered columns for ease of reference. Column numbers generally should not be used in Army reports. Column letters should always run from left to right beginning with the stub, and be located directly below the boxhead. They are separated from the boxhead and the field and stub by single horizontal rulings. The table above illustrates the use of column letters and line-numbers.

	Army Area and Installation	Number of Vehicles	Cost of Operation	
	A	B	C	
1	TOTAL			
2	FIRST ARMY AREA	———	———	
3	Boston Army Base .			
4	Buffalo Recruiting Main Station . .			
5	Fort Devens . . .			
16	SECOND ARMY AREA	———	———	
17	Fort Campbell			
18	Carlisle Barracks			

THE FIELD

That part of a table which contains the numerical data is called the FIELD. This is the part below the boxhead, and to the right of the stub.

The field is set off from the rest of the table by three rulings: one at the top (to separate it from the boxhead), one at the left (to separate it from the stub), and one at the bottom.

Component Parts of the Field

1. Cell - the space normally occupied by one figure entry in the field. A cell without a figure entry should contain a word entry or a symbol to explain omission of the figure (see "Every Cell Must Have an Entry," below).

2. Line - a horizontal row of cells opposite a stub caption.

3. Column - a vertical row of cells under a column heading.

Field Spanners

These are spanner headings that cross the table within the field as shown in Tables 1B, 2 and 3 on page 33. A single boxhead, therefore, applies to all levels of the table. An identical stub may be repeated with each level, or the stub captions may be different for each field spanner.

Field spanners may be used for the following purposes:

1. To reduce the width and increase the depth of a table with an unusually wide boxhead and a shallow stub (see Tables 1A and 1B, page 33).

2. To avoid repeating the boxhead with each repetition of the stub (see Tables 1B and 2, page 33).

3. To reduce the number of times an identical stub must be repeated (see Table 3, page 33).

4. To permit placing long major group captions in the field when space limitations prevent their placement in the stub (see Table 2, page 33).

5. To permit combining several short related tables with a common boxhead into a single compact table (such as a time series percentage distribution of enlisted personnel by length of service, age, education, and marital status).

As a general rule, field spanners should be avoided whenever possible because they break across the columns and separate the column headings from the figures described.

Sometimes these spanners can be shifted to the stub, as in Table 1C, page 33. This can be done by using abbreviations, or short terms with qualifying footnotes. If a stub can be made slightly wider, or an extra line used for each caption, the abbreviation might be avoided.

Units of Measure

Units of Measure should not be placed in the field. The standard place for them is inside the boxhead as a parenthetical addition to a column heading or as a separate column heading, or in a headnote above the boxhead.

Occasionally a field spanner may also include or be a unit of measurement (see Table 1B, page 33).

Every Cell Must Have an Entry

An empty cell, where a column and row meet, causes uncertainty. Were no data reported? Was the figure received too late to be included? Is there some reason why a figure is not called for in this space? Was the figure left out by mistake?

Some of these questions may answer themselves; but in most cases they do not. Even if the reader could find the answer by studying the table, it is better to save him the trouble.

The standard is to put something in every cell, and to use the following customary symbols where appropriate:

a/ b/ etc. (Reference Letter) means look for a footnote beginning with this reference symbol at the bottom of the table. Always use a series of these when there is more than one reference note. (a/ can be used when there is only one.) They should be used in alphabetical order - across and down the table (see: "Where to Place Reference Symbols", page 35).

(Reference letters are used in tables and comparable reference numbers are used in text to minimize errors arising from failure to realize that the symbol is a symbol. For example: 10/ in an otherwise blank cell could be read, or copied erroneously, as the quantity 10.)

* (asterisk) means look for a reference note beginning with this symbol. It can be used when there is only one reference note.

0 (zero) is a number, and means a quantity of none; (as: Percent completed, 0; Production during month, 0). It does not mean an absence of data.

-- (double dash) means that no number is applicable. It should be used only when the reason is immediately obvious. For example, in a percent distribution column where only one subtotal is distributed percentagewise, the group caption line would indicate 100.0 and each line thereunder the appropriate percentage. All other lines would contain the double dash.

\- (dash) should be used in the field only to mean "minus" or negative; (as: -641).

\+ (plus sign) should likewise be used in the field for "plus" or positive figures when they are shown with minus figures (as: Net Change; Aug. +62, Sep. 15). The plus and minus signs may also be endorsed in parentheses to minimize the possibility of misinterpretation in small tables with adequate room.

Symbols such as E, for estimated; P, for preliminary; and NA, for not available may be used in exceptional situations. For example, they might be used for tables produced daily or weekly, with limited space, for sophisticated,

EXAMPLES OF ENTRIES IN THE FIELD

STUB FIELD ⇦ BOXHEAD ⇨

TOTAL	E 75,045	$14,075	+ 150.1	P 10,755	100.0	--	745	a/ 330
GROUP CAPTION	E 40,643	10,020	+ 25.2	6,350	59.0	--	550	165
Line Caption	E 10,603	5,005	- 6.6	6,025	49.7	--	190	b/
Line Caption	20,040	2,505	- 7.3	325	c/	--		0
Line Caption	10,000	2,510	+ 39.1	0	9.3	--	360	165
GROUP CAPTION	34,402	4,055	+ 124.9	P 4,405	41.0	100.0	195	165
Line Caption	10,291	1,030	+ 159.2	P 2,205	20.5	50.1	25	40
Line Caption	24,111	2,020	0.0	1,200	11.2	27.2	70	12
Line Caption	7,870	1,005	- 34.3	1,000	9.3	22.7	100	113

a/ Footnote relating to figure shown.
b/ Footnote relating to the omission of a figure.
c/ Less than 0.05 percent.
E Designates an estimated figure.
P Designates a preliminary figure.
-- Designates a cell for which data are not applicable, and the reason is clearly understood without a reference symbol and reference note.
0 Designates a zero quantity, not the absence of data

USE OF FIELD SPANNERS

A short, wide table with repeated column headings under two or more spanner headings . . . . . .

Fiscal Year	Average Number				Number per 1,000 Average Strength			
	Total	Confined	AWOL	Sick	Total	Confined	AWOL	Sick
19X2 . . .				(1A)				
19X3 . . .								
19X4 . . .								

. . . when rearranged to make a repeated-stub table, may require Field Spanners like this:

Fiscal Year	Total	Confined	AWOL	Sick
	Average Number			
19X2 19X3 19X4			(1B)	
	Number per 1,000 Average Strength			
19X2 19X3 19X4				

But Field Spanners can often be avoided by putting headings in the stub, like this:

Fiscal Year	Total	Confined	AWOL	Sick
NUMBER				
19X2 19X3 19X4			(1C)	
RATE a/				
19X2 19X3 19X4				

a/ Number per 1,000 average strength.

Long, major group captions in a narrow stub may be converted to Field Spanners:

Missile System	Total	Jun	Jul	Aug
	Pay and Allowances			
TOTAL . .				
Missile A . .		(2)		
Missile B . .				
Missile C . .				
Missile D . .				
Missile E . .				
Missile F . .				
Missile G . .				
	Operations and Maintenance			
TOTAL . .				
Missile A . .				
Missile B . .				
Missile C . .				
Missile D . .				
Missile E . .				
Missile F . .				
Missile G . .				
	Research and Development			

Stub repetition is reduced by Field Spanners:

Component	Basic Trained	Unit Trained	Basic Trained	Unit Trained
	First Army		Second Army	
TOTAL				
Regular Army				
Army Reserve				
Natl Guard				
Army of U.S.				
	Third Army		Fourth Army	
TOTAL		(3)		
Regular Army				
Army Reserve				
Natl Guard				
Army of U.S.				
	Fifth Army		Sixth Army	
TOTAL				
Regular Army				
Army Reserve				
Natl Guard				
Army of U.S.				

regular readers. The meaning of these symbols should be indicated either in a footnote, or in a glossary of terms and abbreviations in the front part of a report. Generally, however, reference symbols (such as a/, b/, c/, etc.) are preferable.

Zeroes and Decimals

If a column of figures contains any decimal fractions, insert a cipher to the left of the decimal point for figures less than one (including zero); and for whole numbers (numbers without fractions), insert the decimal point and cipher (or ciphers) to the right of the numbers.

Exceptions may be made when space is exceedingly tight or when the numbers have a special significance such as those in this manual concerning line weights which are the same as certain pen numbers divided by 1,000.

All of the figures in the column usually must have the same number of ciphers or digits after the decimal point. If the column of figures consists entirely of whole numbers, do not put decimal points or ciphers to the right of the numbers. Examples are shown below:

Item A . . 0.0	Item A . . 0.00	Item A . . . 0
Item B . . 0.8	Item B . . 0.81	Item B . . . 1
Item C . . 3.0	Item C . . 3.00	Item C . . . 3
Item D . . 4.9	Item D . . 4.98	Item D . . . 5

Dollar and Percent Signs

A dollar sign ($) is put before the first figure in a column of the field when all figures in that column refer to money. This sign may be omitted if a unit of measurement in the headnote, boxhead, or field spanner indicates that all of the figures in the table represent dollar values: (Millions of dollars, Thousands of dollars).

A percent sign (%) should not follow figures. The fact that the numbers represent percentages should be indicated in the title, boxhead, or stub. Usually it is better to use the word "percent" and avoid the word "percentage" in making this explanation.

Commas in Figures

Commas should be used to set off each three digits in a whole number. If space is extremely limited, it is permissible to omit the commas, but this is seldom desirable and should be avoided, particularly if any of the figures exceed more than four digits. It is often better to abbreviate the figures or redesign the table rather than to omit the commas.

Placement of Figures in the Column

The largest figure in each column should be centered within the vertical rulings. It should have a minimum of one blank typewriter space on each side of the figure; the remaining figures are then lined up with the right-hand side of this figure.

When the number of blank spaces is uneven, put the extra space to the left of the figure. When the caption in the stub takes two or more lines, place the figures on the same line used by the last line of the caption.

TABULAR NOTES

A note is a special explanation that the reader needs to help understand the table or a part of it. This mode of explanation should be used when the information provided does not logically belong in the title or in one of the column captions, or when it is too long to be included in such captions.

Some of the notes that appear on tables may not be needed, but omission of needed notes is a more common fault with the result that the reader is given insufficient information about the content and coverage of figures to make proper use of them in the decision-making process.

Careful consideration should be given to the needs of the reader. Often he may be given sufficient information through precise wording of the title (or subtitle), or of the headings of the columns which eliminates the need for a note. A note should always be used, however, when it will take a technical explanation out of the title.

Kinds of Notes

Tabular notes may be grouped into three categories based on the location of the note. Notes at the top of the table above the top ruling are referred to as headnotes. These notes are needed occasionally. Those that go inside the table, usually in the field, are referred to as body notes: they are rarely used and only in unusual situations. Notes that appear at the bottom of the table below the last rule, including general notes, and source notes as well as the more customary reference notes, are referred to as footnotes. Footnotes are used quite often.

Headnotes

A headnote generally applies to the whole table and is so important that the reader must read it before he uses the table. A headnote usually is a continuation of the title, explaining all or part of it as illustrated below:

(Based on a 5% sample of male commissioned Officers)
(Oversea inventories based on incomplete reports)

A headnote is not a subtitle that is a part of the title. A headnote is added information about the title. The most frequent use of a headnote is to show units of measurement, like:

(Millions of dollars)
(Thousands of short tons)

The one exception to the rule that a headnote should apply to the entire table is when it is used to indicate a unit of measurement that applies to only part of the data. This use of a headnote is appropriate when the statement would be too long or too awkward to include in a column heading, or when it might apply to many but not all of the columns. Examples of such exceptions follow:

(Rates per thousand average strength)
(Tonnage in thousands of short tons)
(Strength in thousands)

Do not use a headnote to show the unit of a single column: This puts too much emphasis on one small part of the table. Do not use them unless they are necessary.

Placement. Put a headnote in the second line above the top ruling of the boxhead and in the second line below the title, or subtitle. This leaves one blank line below and above it. If space is tight, omit one of the blank lines.

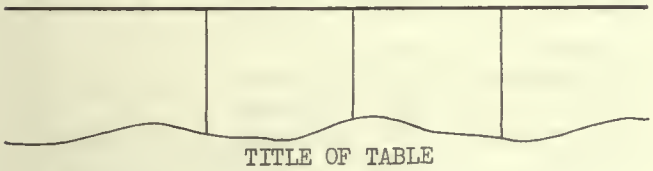
If the note explains the title, omit the blank line above; if it is a unit of measurement, omit the line below.

Examples:

TITLE OF TABLE

(Normal location of headnote)

TITLE OF TABLE
(Headnote about title here, if space is tight)



TITLE OF TABLE

(Unit of measurement here, if space is tight)

A one-line headnote is always centered left to right. The second line of a two-line headnote is centered under the first line.

Style. Headnotes are typed in lower case letters (no capitals except the first letter of the first word and the first letter of proper nouns), and they are inclosed in parentheses.

Body Notes

The only reason for setting a note inside the table is to give it strong emphasis when the reader is using the data. Few notes about one small part of a table are this important. The standard practice is to put a reference where the note applies, and make the note a footnote.

The space available for a note in the body of a table is generally so restricted that the question of whether to put the note there or at the bottom of the table usually answers itself. But once in a while there is both the need and the space. Some examples are shown below:

Production to start in July.
No contract for this item.
Discontinued 1 Oct 1945.
Cancelled.

Footnotes

Most tabular notes are footnotes, and these may be classified in four types:

1. Specific reference notes - these refer to a specific part of the table and they start with a reference symbol (a/, etc.). An asterisk (*) may be used if there is only one note.

2. Special notes - these refer the reader to another page. Example: "See footnotes at end of table."

3. General notes - these relate to the whole table and start with the word "NOTE."

4. Source notes - these explain the source of the data and start with the word "SOURCE:." When a source explanation is given for only a part of the table, use a specific reference note. A reference note explaining all sources may also be used.

Most footnotes are specific reference notes. General notes are seldom needed; when they are, they often are used as a headnote.

Source notes serve two purposes: They refer the user to the source of the data, and they give credit to the originating organization or person. The source reference may be useful to indicate the technical content of the data and tells the user where additional detail may be obtained. Source notes are only one means of indicating sources of data: where one or more sources are used for a series of related tables in a report, they may be indicated in the Introduction, Explanatory Notes, or Technical Appendix portion of the report, rather than be repeated on each table.

Where to Place Reference Symbols

In the title, the stub, or the boxhead put the reference symbol after the word or group of words to which it relates.

In the field, put it before the number to which it relates, but if it relates to a word entry in the field, put it after the word.

In a cell without a number or word entry, put it at the right side of the column (under the last two digits - as shown in table below).

Place the reference symbol before the first word of the footnote itself at the bottom of the table.

A reference symbol should be close to the item to which it relates; for example:

Copper a/ . . b/ 2,964

It would be better to put reference symbols half a space above, like this:

copper a/ . . b/ 2,964

but this is hard to do unless the typewriter has a special ratchet for half-spacing. Moreover,

there is not room to raise the reference marks unless the lines are double-spaced. This generally wastes too much space: double-spaced tables are almost twice as long as single-spaced tables. Leave one blank space between reference symbols and points of reference where space permits.

Reference symbols generally should go from top to bottom of the table and from left to right. When used opposite figures of about the same length they may be lined up vertically. The sequence of tabular reference symbols is shown in the table at the bottom of this page.

Where and How to Type a Footnote

Footnotes of the table are always put at the end - not at the bottom of the page (unless the table end is at the bottom). The standard arrangement for single-page tables is to:

1. Put the first line of a footnote in the third line below the last typed line in the body of the table; this allows one blank line above and one below the ruling at the bottom of the table. If space is tight, put it in the second line.
2. Put notes one under the other (each one starting a new line) whenever space is available. Otherwise put a few short notes one after another on the same line.
3. Start each reference symbol (or the word "NOTE" or "SOURCE:") at the left edge of the table.
4. Start the first word after a lettered symbol in the fifth space from the left edge. Leave two blank spaces after the symbol.
5. Start the second line of lettered notes at the left edge of the table.
6. Single-space all footnotes. Leave no extra space between any lines.
7. Type in lower case letters except first letters of first words and proper nouns.

Footnotes on "Continued" Tables. On multi-page tables all footnotes should appear on the last page of the table (they may appear on the last two pages of a table comprised of a series of repeated-stub, facing pages). All pages except the last should carry two special footnotes: "(Continued on next page)" and "(See footnotes at end of table)," or "(See footnotes on page 000)." Only the first notes appear on the next to the last page of a table consisting of a series of repeated-stub, facing pages, with footnotes divided between the last two pages.

The first special note is placed in the first line below the bottom horizontal ruling, and the second special note is placed in the third line below this ruling. One blank line is left between the first special note and other types of footnote.

Order of Footnotes

When more than one kind of footnote is used in a table, place them in this order:

1. Special notes.
2. General notes.
3. Notes starting with reference symbols.
4. Source notes.

A TABLE ABOUT TABULAR NOTES

(When used, a headnote goes here. See page 35.)

Kind of Note	Where Placed	When Needed	Examples on Page-
HEADNOTE . . .	Above		
About Title	Above	Occasionally	00
Unit/Measure	Above	Occasionally	00,00,00
BODY NOTE . .	Inside	Seldom	00,00
FOOTNOTE . . .	Below		
Special a/ .	1st	Varies	00
General . .	2nd	Seldom	00
Reference b/	3rd	Often	00,00,00
Source c/ .	4th	Varies d/	00

(Continued on next page)

NOTE: A general note not important enough to be a headnote is put in a footnote like this.
a/ Special instructions like "(Continued on next page)" are put first, as shown above.
b/ Reference notes start with a reference symbol and are put in alphabetical order.
c/ A source note about part of the table is treated as a reference note.
d/ See text, page 000.
SOURCE: Handled like this if it applies to the entire table.

The kinds of note used in a single table, a series of related tables, or a report, should be kept to a minimum.

SEQUENCE OF REFERENCE SYMBOLS a/

Stub Heading b/	Column Heading c/	Spanner Heading d/		Column Heading h/	Spanner Heading e/		Column Heading f/
		Spanner Heading g/					
		Column Heading k/	Column Heading l/		Column Heading i/	Column Heading j/	
TOTAL	98,652	12,052	m/ 10,976	30,829	20,696	12,965	11,134
Line Caption	20,256	3,069	n/ 6,843	5,260	2,123	1,926	1,035
Line Caption o/	8,705	2,135	1,871	1,895	829	613	1,362
Line Caption	6,410	790	1,393	1,632	p/	1,645	950

Examples of Footnote Location

Some of the standard procedures for locating footnotes at the ends of tables, which are discussed on the preceding page, are shown in the illustrations appearing below.

The examples pertain to both single-page and multipage tables prepared for typewritten Army statistical reports. The style manual of the U. S. Government Printing Office should be consulted when preparing tables that are intended to be printed by that agency.

Note especially the standard indentions of the footnotes from the left-hand margins of the pages.

SINGLE-PAGE TABLES

Item	67,423	116.2	28,423

a/ Standard placement of a footnote. One blank line above and one below the bottom ruling.

Item	67,423	116.2	28,423

a/ Place footnote here only if space is tight.

Item	67,423	116.2	28,423

a/ Reference notes should be listed one under another in alphabetical order.
b/ This makes each reference easier to find.
c/ This repeats the order in which the reference symbols appear in the table.

Item	67,423	116.2	28,423

a/ This one-after-another method is best when space is tight. b/ Less than 0.1 percent.
c/ See definitions page 00. d/ Not available.
e/ Completed 31 Jul. f/ Less than $500.

Item	67,423	116.2	28,423

a/ All footnotes start at the left edge of the table. The first word in a lettered reference note begins in the fifth space, or in the fourth space if an asterisk is used.
b/ Notes are single spaced.

Item	67,423	116.2	28,423

NOTE: The second line of a footnote is placed at the left edge of the table.
a/ Footnotes are typed in lower case letters. They are the only tabular elements that end with a period.

"CONTINUED" TABLES

Continuous stub tables:

Last line caption	(All pages except last)

(Continued on next page)

See footnotes at end of table.

Last line caption	(Last page of table)

a/ Usually a note about title or column heading.
b/ Usually a note about stub or field item.

Repeated-stub (double - page-spread) tables with footnotes on last two pages:

Last line caption	(All pages except last two)

(Continued on next page)

See footnotes at end of table.

Last line caption	(Next to last page)

(Continued on next page)

a/ This example assumes five specific notes, totaling six lines. The first goes here.
b/ The second goes here.

Last line caption	(Last page of table)

(Continued on next page)

c/ The third note goes here.
d/ The fourth here.
e/ The fifth here.

TABULAR RULINGS

Rulings are used to help explain the organization of the table. When a table is extremely crowded - or extremely empty - rulings also help the eye to locate figures accurately.

Many tables are overruled - that is cut up into many small pieces - which makes the table appear cluttered. Others are underruled or have no rulings at all. This makes them unnecessarily hard to comprehend.

WHERE TO PUT RULINGS

Tabular rulings should be uniform from one table to the next, but rigid standardization defeats the primary purpose, which is to help the reader understand and read each table. When an unusual table needs a special ruling treatment - use it: but be sure that the table really is unusual and not just one that should be redesigned. Otherwise, follow these standards:

USE A VERTICAL RULING between all columns of data (including column headings) and between the first column and the stub.

Do not use outside vertical rulings (at the left edge of the stub or the right of the last column).

USE A HORIZONTAL RULING above and below the boxhead and below the last line of data; also, between column headings and the spanner headings above them. When column letters are used, put them below the bottom ruling of the boxhead and draw another horizontal ruling beneath the column numbers.

Do not use horizontal rulings across the stub and field: instead, make best use of capitalization, underlining, indention, and spacing in the stub to separate and clarify successive lines or groups of data. Usually the boxhead rulings, and the one at the bottom of the table, are the only horizontal rulings needed. Excessive rulings, and rulings too heavily drawn, dominate the presentation; tend to obscure the figures; and are time-consuming to draw.

WEIGHT OF RULINGS

Two weights of ruling are usually enough. One should be clearly heavier than the other: lines that are just a little different are not recommended. Relatively small gradations of line weight may be useful if the table is to be used without reduction, but if it is to be reduced in reproduction, small differences cannot be seen.

The following weights are recommended:

1. Heavy —— .02" (About 1 1/2 points*)
2. Light —— .01" (About 3/4 point)

The line weight scale shown on page 102 of the Graphic Presentation Chapter shows these and other standard ruling weights.

* A point is a printer's measure = 1/72 inch.

After the final typing, draw all tabular rulings, including underlining of stub captions and field entries, with a ruling pen and black drawing ink.

In a simple table, only two lines need to be heavy: the top and the bottom horizontal rulings. In a large complex reference table, and in other special circumstances, heavy vertical rulings may sometimes be necessary. Heavy rulings, however, are most effective when used sparingly.

BLUE PENCIL RULINGS

Even when a table is typed on typing layout paper (printed with light blue lines that match typewriter spacing), the draftsman should usually be shown exactly where rulings are to be drawn. (Quite often the rulings should not be made on the printed blue lines, but between them.)

Each table should be ruled faintly in non-photographing light blue pencil before giving it to the draftsman for inking. (Blue pencil lines that are heavy sometimes interfere with the even deposit of black ink.)

If the tables are repetitive and if the draftsman is thoroughly familiar with a standard pattern established for ruling such tables, the blue pencil rulings may be omitted. They may also be omitted if the draftsman is sufficiently familiar with both standard principles for ruling statistical tables and the meaning of the tabular data presented. A professional table designer can generally speed up production and accuracy if he rules the tables in pencil rather than depending on the draftsman to make the rulings after studying relationships between the various entries in the table.

If there is insufficient time to draw in the complete set of blue guide lines, put a light blue pencil mark to show where to place each ruling.

OTHER RULING CONSIDERATIONS

The above standards are intended primarily for tables prepared for reports that are to be reproduced by the photo-offset process.

The standards for placement of rulings are also applicable to tables reproduced by other methods, but when necessary a single weight produced by stylus or special pencil may be used for all rulings.

In tables for which all copies are produced through use of typewriter carbons, all horizontal rulings, including lines separating spanner headings from the column headings beneath them, are usually made with the typewriter. Vertical rulings may be omitted if spanner and column headings are spaced far enough apart to avoid confusion. If the table is a text tabulation, the only rulings necessary are those for the underlining of the bottom of each column heading, and, if appropriate, stub captions and field entries denoting sub-totals.

SPACE REQUIREMENTS

In designing tables, adjustments often must be made to resolve conflicts between the needs for content and the availability of space. Frequently, a number of trial layouts are necessary in making these adjustments.

TABLE WIDTH AND LENGTH

Table WIDTH is determined by two factors:

1. Horizontal space required for the stub and column headings in the boxhead.

2. Horizontal space required for the longest caption in the stub and the longest figure in each column in the field.

Table LENGTH is determined by the vertical space occupied by the title and subtitle, headnotes, stub and column headings, stub captions, and footnotes.

Generally, considerations of width are more important than length in planning the layout of a table. Long tables can be presented effectively on several pages, if necessary. Tables, too wide to present on one page, however, result in less effective presentation (i.e., the boxhead could be extended across two facing pages; the table could be arranged in two or more decks having the same stub, but with different column headings; or the material could be shown in two or more separate tables).

The consecutive steps to follow in planning the width of a table and the arrangement of the boxhead are described below. The procedures will vary somewhat from table to table, depending on the specific problems encountered. Typing each step will be helpful, but is not necessary if the spacing is planned carefully and if counted accurately.

The example which follows requires fitting a table to a width of 48 typing spaces (the width of this column of text). The original layout of this table is illustrated at the bottom of this page in Figure 1A.

The first step is to count the number of characters and spaces needed for each column heading and for the longest stub caption and the widest field entry in each data column. This count should include an allowance for the standard one blank space on either side of the widest line in each column heading, the widest field entry in each column and on the right side of the longest stub caption. This count may be recorded for convenience in pencil in each column heading and on the first line of the stub and field, as illustrated in Figure 1A. The space count for the boxhead is then totaled, as is the count for the stub and field. In this trial layout, the boxhead requires 57 spaces and the stub and field entries 72 spaces.

The second step is to reduce the width of the boxhead to the required 48 spaces. In this table, a spanner heading is used for the first two data column headings, the word "Adjustments" is divided into two lines, and the phrase "End of Month" is re-phrased "Month-end"; in addition the blank spaces to the left of the stub heading and to the right of the last column heading are eliminated. This reduces the boxhead width to 45 spaces.

The third step is to abbreviate the stub, and narrow the data columns by eliminating the dollar signs and, when appropriate, rounding the figures to thousands, using a headnote to indicate the unit of measurement. This reduces the combined width of stub and field to 45 spaces.

The fourth step is to compare the revised space requirement for each column heading with that for the stub and the field entries for each column, and reconcile any differences. That is, use the largest of the two space requirements for each column.

After taking all four of the above steps, the material shown in Figure 1A could be presented in the more compact single-column table illustrated in Figure 1B.

(Thousands of dollars)

Month (1B)	Obligations		Payments	Unpaid Obligations, Month-end
	Incurred	Adjustments		
Jul	973,299	- 199,269	1,016,454	5,229,252
Aug	686,433	- 40,770	944,225	4,930,690
Sep	700,249	+ 18,119	934,201	4,714,857
Oct	762,938	- 64,121	673,533	4,740,141
Nov	795,767	- 106,087	1,019,016	4,410,805
Dec	845,843	- 42,611	759,314	4,454,723

The procedures and the principles described above also apply to fitting a table to a full-page width (100 spaces in manual).

7 Month (1A)	13 Obligations Incurred	13 Obligation Adjustments	10 Payments	14 Unpaid Obligations End of Month	7 + 13 + 13 + 10 + 14 = 57
10	14	• 16	16	16	10 + 14 + 16 + 16 + 16 = 72
July	$973,298,770	- $199,268,904	$1,016,453,592	$5,229,252,349	
August	686,432,912	- 40,769,646	944,224,904	4,930,690,711	
September	700,248,981	+ 18,118,822	934,201,147	4,714,857,367	
October	762,937,817	- 64,120,825	673,532,620	4,740,141,739	
November	795,767,248	- 106,087,495	1,019,015,658	4,410,805,834	
December	845,843,181	- 42,611,875	759,313,901	4,454,723,239	

The following table summarizes these four steps and shows how to condense the requirement to the standard 48 spaces:

Step and Procedure	Number of Spaces Total	Stub	Col 1	Col 2	Col 3	Col 4
1. Original layout:						
Column headings	57	7	13	13	10	14
stub and field	72	10	14	16	16	16
2. Reduce width of column headings	45	6	10	9	10	10
3. Shorten stub and round figures	45	4	9	11	11	10
4. Use highest figure in steps 2 and 3	48	6	10	11	11	10

UNUSUAL SPACING PROBLEMS

Most tables when first designed will not fit the space exactly. A little spreading or squeezing, however, if carefully done, usually will bring them to the right size. Even though typewriter spacing is fixed, there are many ways to adjust the size of the tables.

Adjusting a "Tight" Table

The usual trouble in tabular layout is too much material for too little space. The reasons for excess width usually include: too many columns, many-digit figures, lengthy column headings, lengthy stub captions; and those for excess depth include too many stub items, too many lines or levels in the column headings.

If there is not enough space left to right:

1. Look for columns of figures that could take more "rounding."
2. Look for the wide column headings that could be broken into more lines.
3. Look for words in column headings that could be abbreviated.
4. Look for related column headings that could be put in fewer spaces by placing duplicating words in spanner headings.
5. Look for long stub captions that can be abbreviated or can be put on more than one line.

If there is not enough space up and down:

1. Remove the blank lines between group captions and their components.
2. Remove the blank lines above group captions.
3. Remove the blank line below the total.
4. Look for column headings that can be put on fewer lines by abbreviating or by making the column wider.
5. Delete the standard blank line allowance in column headings (see page 29).
6. Put two or more short footnotes on the same line (see page 37).
7. Omit the blank line below or above a headnote (see page 35).
8. Omit the blank line between the lower horizontal ruling and the first footnote (see page 37).

Adjusting a "Loose" Table

Sometimes the material is too sparse for the space. The reasons for surplus width include very short stub captions, very few columns of figures, and one or two-digit figures; and surplus depth usually results from very few items in the stub.

If there is too much space left to right:

1. Add extra space to the width of the total columns.
2. Add extra space in the other columns.
3. Add extra space at the right side of the stub.

If there is too much space up and down:

1. Add blank lines between major breaks of the stub.
2. Add a blank line or two in the boxhead.
3. Add a blank line below secondary captions in the stub.
4. Use more frequent line breaks in a long series of items (for example, group by 2's instead of 3's, 3's instead of 5's, etc.).

HANDLING EXTREME CASES

Sometimes spreading, squeezing and rearranging is not enough. Some tables will not fit the space without drastic redesign.

These troublesome tables generally are:

1. Long and narrow (long stub, narrow boxhead).
2. Short and wide (short stub, wide boxhead).
3. Oversize (much too large in either or both directions).

Extremely long or short tables are discussed on page 41, under "Odd-Shaped Tables."

Oversized Tables

Some oversized tables are so large that the usual procedures cannot be used for fitting them to the standard page. This problem usually can be solved by "breaking" the table or by reducing it.

Odd-Shaped Tables

Tables that are too long and narrow or too short and wide are awkward; especially when they must be combined with other material. The illustrations on this page show two typical odd-shaped tables and how they can be rearranged to fit standard page dimensions.

Stub	Column Heading	Column Heading
Item	123,456	432,567
Item	16,478	42,365
Item	9,543	9,100
Item	5,751	987
	1A	
Item	320,475	76,532
Item	99,650	132,005
Item	57,453	516
Item	4,359	3,255
Item	65,438	110,542
Item	8,447	9,789
Item	113,662	46,347
Item	192	5,639
Item	430	89,035
Item	3,534	400,164
Item	12,345	5,987
Item	478	13,705

Long, Narrow Table: few columns; many stub items.

Table 1A could be spread to fit the standard width (half-page or full-page wide), but this would give it a "padded" look. The location of the stub and column classifications could be switched but that would merely reverse the original problem: the table, instead of being too long and narrow, would be too short and wide. It would be even shorter and wider than Table 2A below:

The best solution is to convert Table 1A to a divided-stub table such as 1B. In this arrangement, the boxhead is repeated in each section of the table and a heavy rule is placed midway from each side:

Stub	Column Heading	Column Heading	Stub	Column Heading	Column Heading
Item	123,456	432,567	Item	65,438	110,542
Item	16,478	42,365	Item	8,447	9,789
Item	9,543	9,100	Item	113,662	46,347
Item	5,756	987	Item	192	5,639
	1B				
Item	320,475	76,532	Item	430	89,035
Item	99,650	132,005	Item	3,534	400,164
Item	57,453	516	Item	12,345	5,987
Item	4,359	3,255	Item	478	13,705

The divided-stub arrangement is especially good for a table that has only one column of figures. In a long list of that sort, the stub can sometimes be split into three or even four sections.

A short table such as 2A could be widened to fill the page width, but then its shape would be even more awkward. Reversing the stub and column headings would make it almost as long and narrow as Table 1A.

The table might be modified by putting the column headings in "decks" or levels and repeating the stub on each level as in 2B. This arrangement is somewhat better than a wide table with many column headings and only two or three rows of figures. Sometimes the table may be so wide that three levels of column headings are needed.

SHORT, WIDE TABLE: many columns, few stub items.

Stub	Column Heading	Column Heading	Column Head.	Column Head.	Column Head.	Column Head.	Column Head.	Col. Head.	Col. Head.
Item	30,338	58,567	123	185	323	343,984	843,967	97	13
Item	13,864	40,345	567	296	98	23,023	1,023	54	34
Item	9,123	23,313	948	538	14	34,931	19,324	68	15

2A

Stub	Column Heading	Column Heading	Column Head.	Column Head.
Item	30,338	58,567	123	185
Item	13,864	40,345	567	296
Item	9,123	23,313	948	538

2B

Stub	Column Head.	Column Head.	Column Head.	Col. Head.	Col. Head.
Item	323	343,984	843,967	97	13
Item	98	23,023	1,023	54	34
Item	14	34,931	19,324	68	15

The column headings on each level of this repeated-stub table relate to the data on that level only. This differs from a repeated-stub table using field spanners (page 33).

Although these examples show how to redesign small summary tables, the same principles can be applied to larger tables. For example, a long table approximately half a page wide could be rearranged to make a shorter table a full page wide.

A short table a page and a half (or more) wide could also be rearranged to make a longer table a full page wide. This avoids showing the table on more than one page.

A third method (for wide tables) is to use a folded page. This is not recommended. Fold-in pages are difficult to read, they are likely to tear and they present special printing and binding problems.

Breaking Oversized Tables. Tables that fit the page one way but are much too big the other way often should be broken.

For example, a table that is much too wide for one page may be broken down the middle and shown on two facing pages. These tables should repeat the stub on the second page if possible.

When the table is about the right width but runs much longer than a page, it can be continued on the following page. This is frequently done if the table would run to more than one and one-half pages. Large reference tables, such as those that show procurement or inventory data for several hundred items, are often continued for many pages.

Sometimes these large tables are both long and wide. Some of these must be spread across facing pages, and continued for several pairs of pages. But even that space is not always enough. Some "continued" tables are so wide that they must be reduced in reproduction to fit even the double-page width.

Reducing Oversize Tables. Many oversized tables are difficult to "break." For example, an inch or two too long, is not long enough to carry over to the next page. A table that is a little too wide is seldom worth spreading to fill the facing pages. In fact, most oversize tables fall into this classification - they will not fit on one page, yet are not worth more than one.

The only solution - after all methods of squeezing and rearranging have been considered and found unsatisfactory - is to reduce these tables in reproduction.

The overall page dimensions of most Army statistical reports reproduced from typewritten copy are 8" x 10 1/2" or 9" x 13". The accompanying table shows the width and length (in elite typewriter spacing) of the oversize originals for each of these final page sizes.

STANDARD SIZES FOR FULL PAGE OVERSIZE TABLES
(Before Reduction)

Percent Reduction	Final Page Size: 8" x 10.5" a/		Final Page Size: 9" x 13" b/	
	Width (Spaces)	Length (Lines)	Width (Spaces)	Length (Lines)
10	87	54	93	68
16	93	58	100	73
20	98	61	105	77
25	104	65	112	82
30	111	69	120	88
36	122	76	132	96

a/ Type page after reduction is approximately 6.5" x 8.1".

b/ Type page after reduction is approximately 7" x 10.2".

These dimensions are for full page tables (oversize in both directions). For tables that are oversize in only one dimension, it is important to remember that reducing any dimension reduces the other in the same proportion. A table that is too wide but not too long, reduces to less than a page long. This usually is not a problem if other material is available to put in the remaining space.

A table that is too long but not too wide, reduces to less than a page wide. This is undesirable unless the page can be reduced to exactly half a page wide. The standard procedure for correcting this problem is to spread the table width so that it will reduce to exactly the page width.

These standard page sizes provide for the tables that range from a little oversize to approximately a third oversize. It is desirable to reduce the table as little as possible.

If there are several oversized tables that would be about the same size, however, make them all exactly the same. This simplifies the reproduction process, and also provides a more professional looking result than different reductions for each table.

Titles of oversized tables generally should not be typed on the same sheet as the table. Instead, the title should be typed on a separate sheet of paper (if the table is the only material on the page) or on the sheet with the accompanying text (if the table is to appear on a page containing other material). This keeps the titles of all tables in a report the same size after reproduction.

PREPRINTED TABULAR FORMS

The standards of tabular presentation stated in this chapter were designed primarily for use in the preparation of pages that are prepared entirely by the typewriter (and, when needed, the ruling pen).

These standards may be applied to a considerable extent, however, to printed or partially preprinted tables.

In any case, the title, column headings and stubs should be prepared as typewritten copy in such a way that the material fits the page reasonably well before it is set in type or preprinted by some other process. Consideration should be given to the size and face of the type to be used and to page dimensions and the amount of reduction, if any.

Preprinted titles, column headings and stubs are suitable for a large number of similar tables, or tables that are prepared in the same manner at recurring intervals.

The preprinted material may be produced by the use of letterpress, if volume is sufficient

to make it economical, or it can be done from typewritten masters by the offset process, or by specialized equipment utilizing punched paper tape. (It is also possible to preprint chart titles and grids to speed up final preparation of the report.)

The figures may be entered on preprinted forms by typewriter, electrical accounting machine, or by electronic computer. When sufficient effort is spent, it is possible to program the computer so that totals and sub-totals appear above and to the left of the items they summarize.

CHAPTER 4
GRAPHIC PRESENTATION

GENERAL

Graphics have these four important uses:

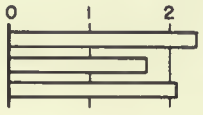
1. To emphasize the main numerical facts;
2. To uncover facts that might be overlooked in text or tabular presentation;
3. To summarize a cumbersome mass of tabular data;
4. To add variety to text or tabular material, thus making the report more interesting to look at and easier to read and understand.

In statistical presentation, the first two uses are the chief reasons for using graphics and the third and fourth are usually by-products. The fourth use, by itself, is seldom sufficient reason for using graphics.

To most people who work with statistics, graphic presentation means charts. This is because charts are much more widely useful (for presenting statistics) than maps or diagrams. For this reason the discussion about graphics in this manual is primarily about charts. Maps are discussed briefly (on page 64), and diagrams not at all.

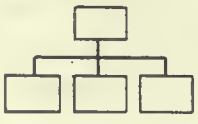
KINDS OF GRAPHICS . . .

. . . used in statistical presentation



CHARTS:
(amount relationships)
show HOW MUCH

MAPS:
(geographical relationships)
show WHERE



DIAGRAMS:
(schematic relationships)
show HOW

For showing statistical data, charts are usually the best, maps occasionally (see page 64), diagrams seldom.

To use a chart effectively, three basic steps should be followed:

1. Select the one specific type that will be most appropriate;
2. Design it to focus attention on the specific point the chart is intended to emphasize;
3. Construct it in such a way that it is easy to read and understand.

These three steps seem obvious. As principles, they are quite simple; but it is not always easy to put these principles into practice. The first part of this chapter discusses step 1; the next part ("Planning and Designing Charts") discusses step 2; the third ("Chart Construction") discusses step 3.

PROS AND CONS OF GRAPHIC PRESENTATION

Advantages

1. QUICK: Shows the main feature of the data at a glance.
2. FORCEFUL: Carries much more emphasis than text or tables.
3. CONVINVING: Proves the point instead of merely stating it.
4. COMPACT: Packs a lot of information in a small space.
5. INTERESTING: Easier to look at than text or tables.

Disadvantages

1. TECHNICAL: Some readers not familiar with statistical graphics.
2. DEMANDING: Takes special "know how" to design effective graphics.
3. COSTLY: Takes more time; also skilled help.
4. NOT ALWAYS USABLE: Some data are not suitable for graphic presentation.
5. NOT PRECISE: Cannot be quoted like text or tables.

Selecting the Right Kind of Chart

In order to select the right type of chart, the designer must know exactly what he is trying to bring out of the data. Regardless of the general subject or of the general kind of comparison planned, a decision must be made as to just what specific point is being presented. Haziness here may lead to the selection of an entirely wrong type of chart for the purpose, or to the choice of a type that is unnecessarily ineffective.

This problem is subjective, and can be solved only by the person responsible for the chart. The draftsman, however expert, cannot be expected to know enough about the purpose of the presentation, the characteristics of the data, or the nature of the audience, to decide this question himself.

The designer may be certain about the specific point he wants to get across, but he cannot go far without knowing what kind of charts are available to choose from. He needs to know what each of the basic chart types can and cannot do, and how to modify each to adapt it to the specific data to be emphasized. More can be done to fit the chart to the nature of the data than may be realized when the designer first encounters the problem.

Caution: Watch for two pitfalls in selecting charts - do not limit them to one or two favorite kinds, and do not make them so complicated and obscure that no one else can understand them.

CHART COMPONENTS

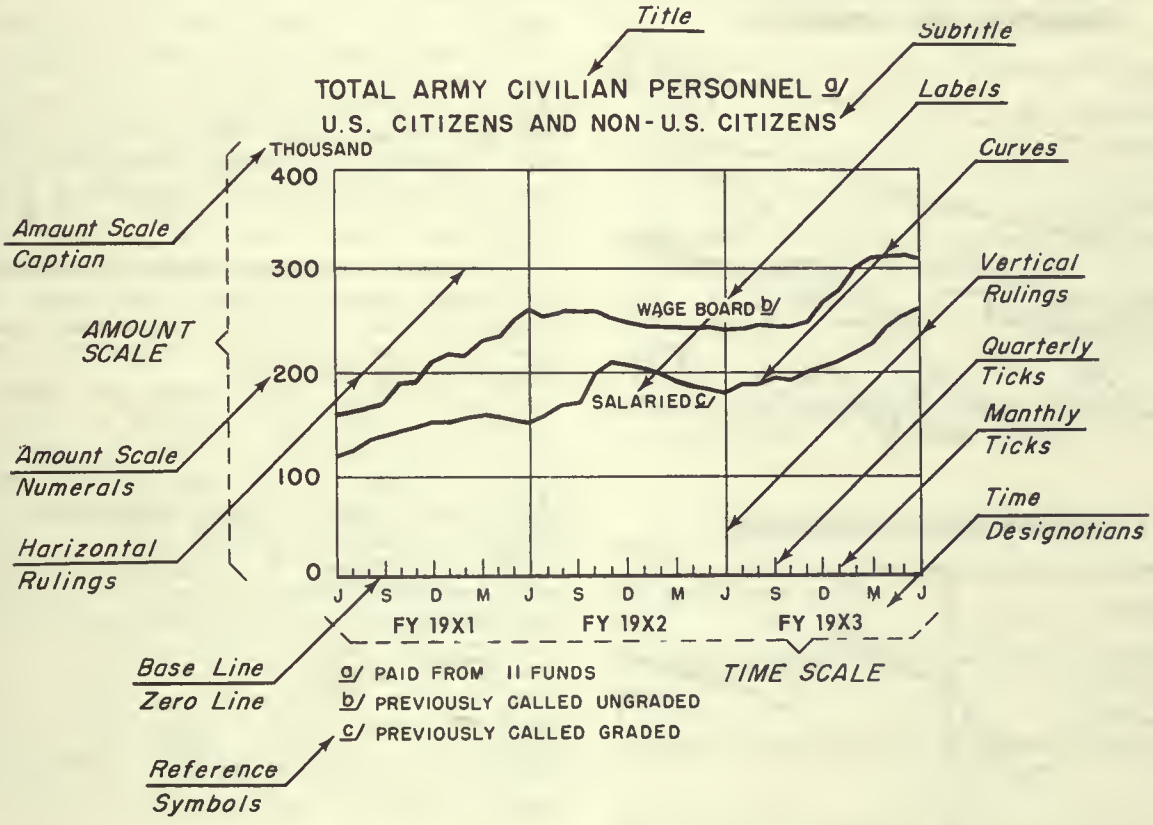
This page shows what the different parts of a chart are and tells what each part is called.

The top illustration is a typical line or "curve" chart. Many charts shown in the next section on "Chart Types" follow this general arrangement. Column charts, which belong to this same family, have a similar framework but make use of vertical bars instead of curves.

The lower illustration is a typical bar chart. Although this is an entirely different kind of comparison, most of its components and their names are the same as for curve charts. But note that a bar chart has a distinguishing feature: a list of items down the side. Note also that the amount scale runs horizontally and that there is no time scale.

A few additional terms are used in other types of charts; but these are explained later, in the discussion about these types.

The terms used for both curve and column charts are those which were officially approved by the American Standards Association in its American Standard "Time-Series Charts" (ASA Z15.2 - 1938, reaffirmed, 1947). A revision of this standard (ASA Y15.2 - 1960) published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N.Y., generally follows this terminology. Neither of these standards covers bar charts.



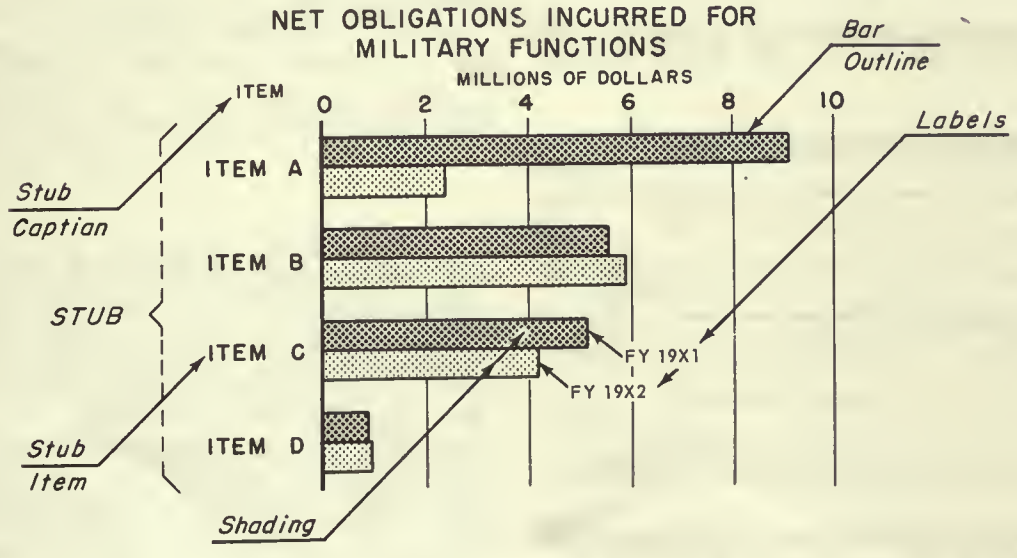


CHART TYPES

The following pages show typical examples of the four main kinds of charts used in statistical presentation. These are: curve charts, surface charts, column charts, and bar charts.

CURVE CHARTS

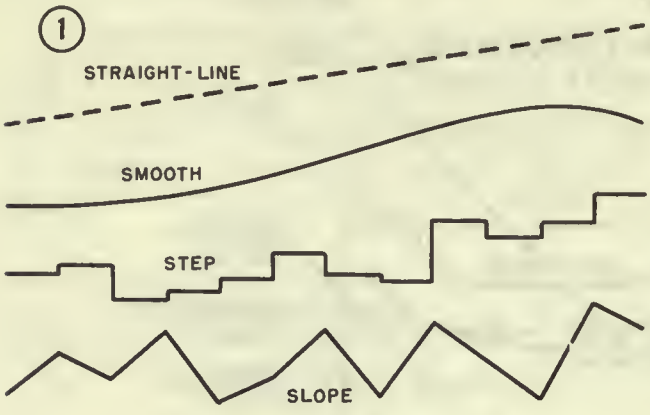
In statistical work, a "curve" is any line that connects a series of plotted points.

Curves can be used in many kinds of charts. Most of the curve charts used in the review and analysis of Army programs are time series charts. Such charts show quantities measured at specified times, such as procurement or strength by month. Frequency distribution charts are used occasionally in Army analysis to show data in specified categories at a particular time, such as officers by age group on a given day (see page 60). Time series are discussed below.

Curve charts are the most widely used form of chart presentation: they can be used for the simplest comparison or for the most complex; they are extremely flexible and can be adapted to a wide range of uses; they are compact, easily carrying much more data than any other type of chart; they are easier to draw - using the same data - than other types.

Curve charts should generally be used when many points are plotted, several series compared, or emphasis is on movement rather than on actual amounts.

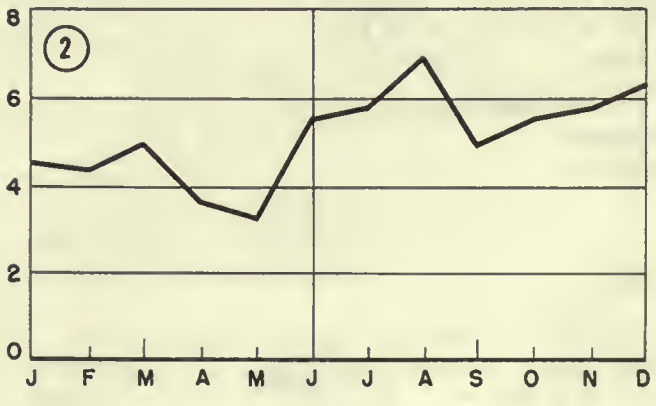
EXAMPLES OF "CURVES"



(1) As shown in Chart 1, curves can follow almost any pattern from a straight line to a zigzag. In most statistical presentation, they have a pattern somewhere between these extremes.

A SIMPLE CURVE CHART shows amount changes in a single series of data. The curve can be either the slope type (2) or the step type (3), depending upon the nature of the data and the purpose of the chart.

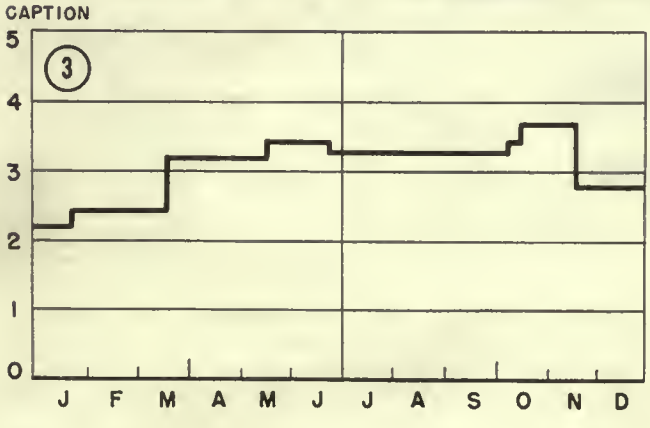
SIMPLE SLOPE-CURVE CHART



(2) A SLOPE CURVE is made by drawing a line directly from each plotted point to the next. Slope curves suggest that changes from point to point are gradual or continuous, and therefore are usually the best way to show data that have a "carry over" from one time to the next. This type of time series is sometimes called "as of" data because it measures how things stand at points of time. Typical examples: month-end inventories, strength, unliquidated obligations. However, when fewer than 4 or 5 time points are plotted, a column chart is usually better.

A slope curve can be used also for "during" data (measurement for periods of time, such as production, personnel separations, expenditures, etc.) although other forms of presentation are often better for this kind of information. (See next paragraph and "Column Charts," page 52.)

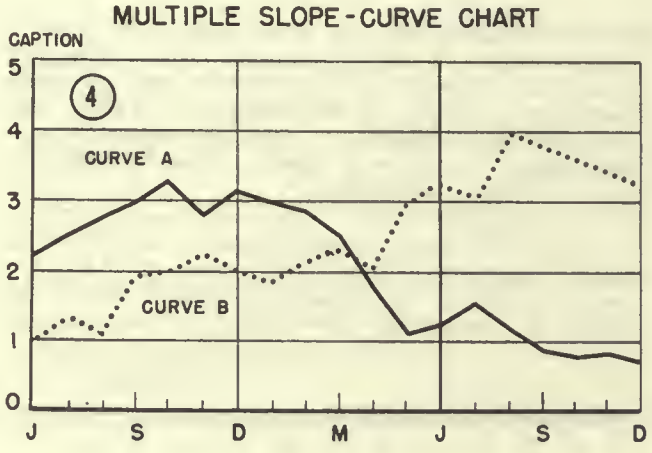
SIMPLE STEP-CURVE CHART



(3) A STEP CURVE is made by drawing a norizontal line through each point and connecting the ends of these lines by vertical lines. It is a good form of presentation for showing averages, or other measures that apply over periods of time. It is especially good for data that change abruptly at irregular intervals, such as allocations of funds, personnel ceilings, etc. Step curves are better than slope curves for showing "period" data, and are often used for this purpose, especially when the time series is a long one. (See also "Column Charts," page 52, and "Connected Columns," page 91.)

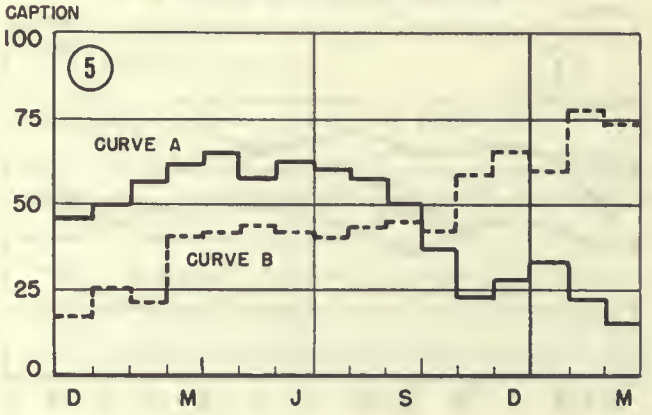
(4) A MULTIPLE SLOPE-CURVE CHART brings together two or more related curves. The curves may be interdependent, such as a total and its components; or independent, such as two or more totals; or nondependent, such as an actual result compared with a forecast or estimate. But whatever the purpose, this type of chart is better if it does not compare too many things at once. A chart with four curves is not necessarily twice as useful as one with two curves; in fact, it may be less useful, especially if the curves criss-cross or run together. Where many curves are to be shown, or several curves have the same magnitude, it is better to use two or more charts with the same scales rather than a single chart (see "Uniform Scales," page 81).

MULTIPLE SLOPE-CURVE CHART



(5) A MULTIPLE STEP-CURVE CHART serves the same general purposes as the multiple slope-curve type, but its use is much more limited. The reason for this is that step curves that cross are hard to follow, especially if they cross back and forth several times. Two or more step curves can be shown on the same chart, however, if they do not overlap or if they cross cleanly, as in illustration 5. (See also "Combination Types," pages 58 and 59.)

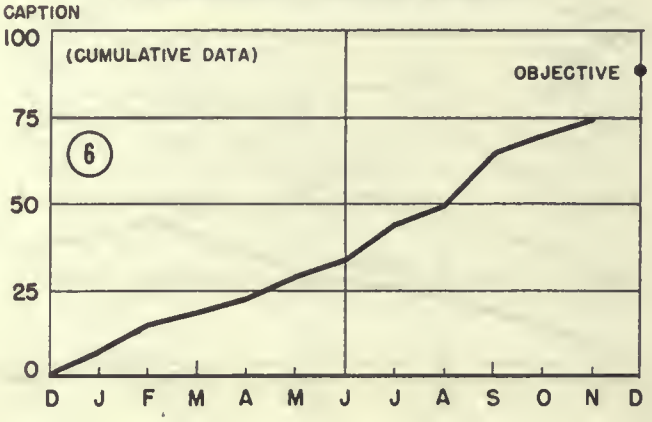
MULTIPLE STEP-CURVE CHART



(6) A CUMULATIVE CURVE CHART presents a running total. It should be used where the primary interest is in the cumulative picture rather than in the amounts for each period. Each point on a cumulative curve shows the aggregate to date: the total for the current period plus all earlier periods. It is therefore a good form of presentation for comparing results "so far this year" with those for the same period last year, or with an annual objective or goal such as the obligation or expenditure of funds.

The process of adding the results for each successive period tends to smooth a cumulative slope curve. It is used mostly for data in which the aggregate can stay the same or increase but can never decrease. If the nature of the subject does not obviously require cumulative data, be sure to label the chart "Cumulative from_____," or "Cumulative Data" as shown in illustration 6.

CUMULATIVE CURVE CHART

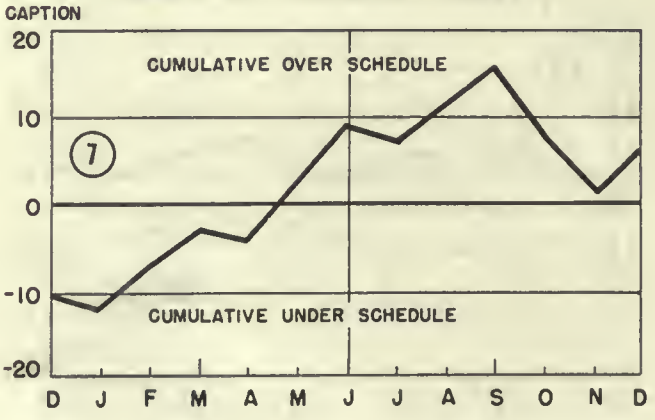


The cumulative idea can be used for step as well as slope curves. The usual limitations of step curves apply here too.

(7) A CUMULATIVE DEVIATION CHART, like any cumulative chart, shows the "total to date" at any point on the curve. This type, however, measures cumulative differences or deviations (for example, net gain or loss in strength, or cumulative deviation from budget or allowance).

This kind of cumulative curve, therefore, can go down as well as up (when the net change is a decrease instead of an increase). See also how this idea can be used in combination with a column chart ("Combination Types," page 59).

CUMULATIVE DEVIATION CHART

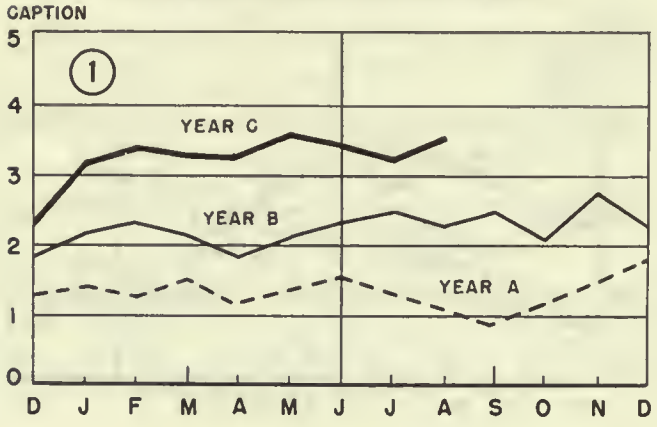


In addition to the kinds of curve charts shown on pages 46 and 47, several others are very useful for presenting statistics. Some of these charts are shown on this page and on the page that follows. These all have one thing in common: they require a special kind of scale or special scale treatment.

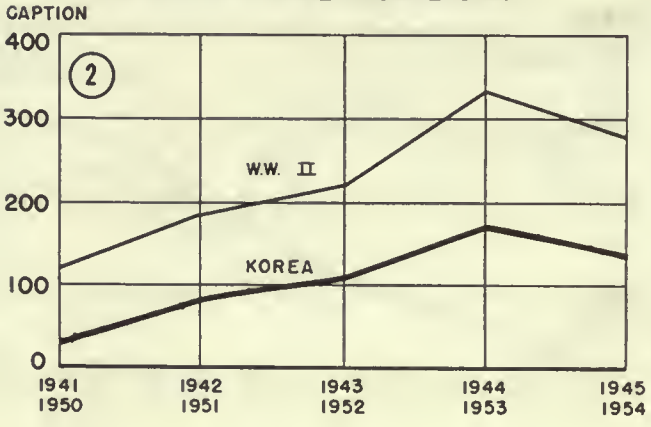
Most of these special-scale charts vary widely in purpose and use. Some of them are useful primarily as analytical "work" charts and should be presented sparingly to readers not accustomed to them. Others are seldom appropriate, but extremely valuable when they are. Some of these examples are not recommended for general use in statistical reporting but are included in this manual to assist the analyst in discovering basic relationships between figures.

Taken together, this group of charts demonstrates how important it is - and how possible it is - to select the one particular type of chart that will focus on the key facts that should be conveyed to the reader.

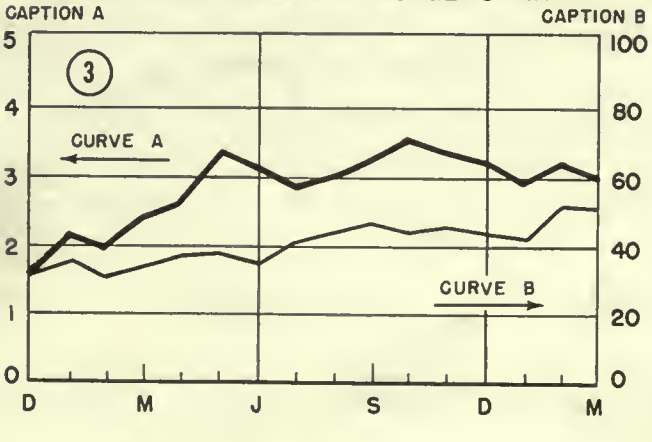
REPEATED TIME-SCALE CHART



MULTIPLE TIME-SCALE CHART



MULTIPLE AMOUNT-SCALE CHART



(1) A REPEATED TIME-SCALE CHART is a method of showing a long curve as a series of short curves. For example, a curve measuring monthly data over a period of several years can be shown as several one-year pieces plotted on a one-year time scale. As illustrated in Chart 1, this method permits easy comparison of comparable time points. It is especially useful: (1) for comparing monthly data that have a seasonal pattern (generally high at certain times of the year, low at others), for example: sickness, AWOL rates, civilian personnel separations; (2) for comparing results "so far this year" with results for the same period last year on some earlier year (cumulative data).

(2) A MULTIPLE TIME-SCALE CHART follows the same general scheme as a repeated time-scale chart, but compares non-repeating time periods. As illustrated in Chart 2, this kind of presentation is used to compare results or conditions during two similar historical periods. Although an extremely valuable chart when used properly, this type is much more difficult to design than a repeated time-scale chart. The main problem is in deciding how to match the periods. For example, in comparing data for WW I and WW II, the time scales could begin at 1917 and 1941, 1914 and 1940, or 1914 and 1939. Depending on the subject, any of these could be used.

(3) A MULTIPLE AMOUNT-SCALE CHART brings together for close comparison two or more curves that are measured in different units or are measured in the same unit but are so far apart in size that they would be difficult to compare. Preferably not more than two amount scales should be used.

If the aim is to compare change or growth, the zero line of both scales should coincide (either on or off the chart), and the scale intervals should be so selected that both curves meet. (This purpose can often be served better by converting both series to a common base, thus requiring only one scale. For example: index numbers, or percent of average for the period.) If the purpose of the chart is to compare the pattern of two or more curves - without regard for their size - the scales need not coincide at zero. Caution: many readers do not understand the characteristics of this type of chart and will misread it (see also page 65 for a misuse of multiple scales).

(4) A SUPPLEMENTARY AMOUNT-SCALE CHART provides two kinds of measurement on a single chart. First, it measures the variations in a series of data, just like any simple curve chart. Then, in addition, it measures the size of this series in relation to another series. For example, a curve measuring officer strength could be plotted against a series of supplementary curves that measure 6, 9, 12, and 15 percent of total military strength (Chart 4). Of course this type of chart can be used for other kinds of data: for example, stock on hand related to allowances, beds occupied related to beds available, or storage space occupied related to total usable space.

(5) AN INDEX-SCALE CHART shows data that have been converted into percentages of a base value. For example, production could be shown each month as a percentage of the level of January 1965. Thus, February might have a value of 102.3, March 105.7, etc. The principal use of index charts is for showing "composite" data such as price indexes. However, they can be used also for comparing two or more series of data that are measured in different kinds of units (such as workload and strength) or in different size units (such as a total and one of its components).

NOTE: Except when working with standard economic indexes such as those for prices, wages, etc. the kind of comparison shown on an index chart may be clearer if presented as simple percentage differences. For example, "Percentage increase in unit costs since 1965" shows exactly the same picture as "Index of Unit Costs - 1965=100", except that the scale is divided to read 0, 25, 50 instead of 100, 125, 150.

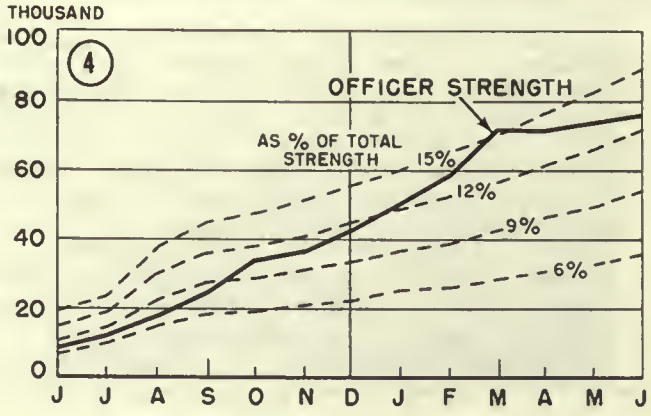
(6) A LOGARITHMIC AMOUNT-SCALE CHART shows the relative change from one time to the next. On this kind of chart a constant increase of (say) 10 percent each month would show as a straight line (slanting up): on an arithmetic-scale chart, a constant 10 percent increase would be a curving line, slanting up but at a steeper and steeper angle.

Charts like Illustration 6 are good for comparing rates of change. They can show whether changes in production are keeping pace with changes in cost, whether changes in a small organization are relatively more or less than changes in a large organization, etc. (See also page 75.)

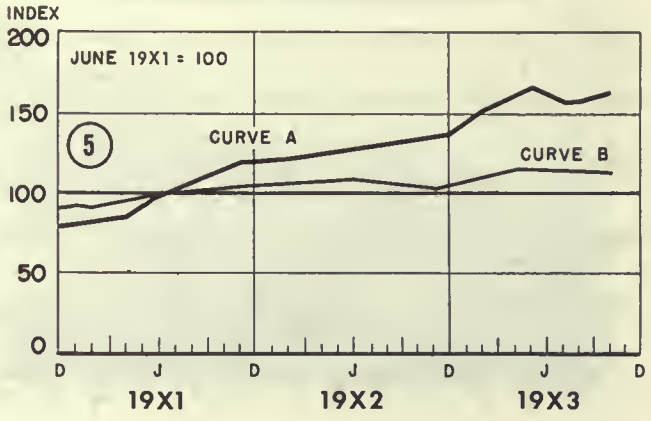
(7) A MULTIPLE-LOG AMOUNT-SCALE CHART shows the same type of relationship as charts with only one of these scales, but permits a comparison of data that are measured in different units (or that are measured in the same unit but are much different in size).

NOTE: This type of chart generally shows relative change from one time to the next. It shows how the relative (percentage) changes in one series compare with the relative changes in another. It should be used when that is the purpose of the chart, and not merely as an easy way to bring two curves close together.

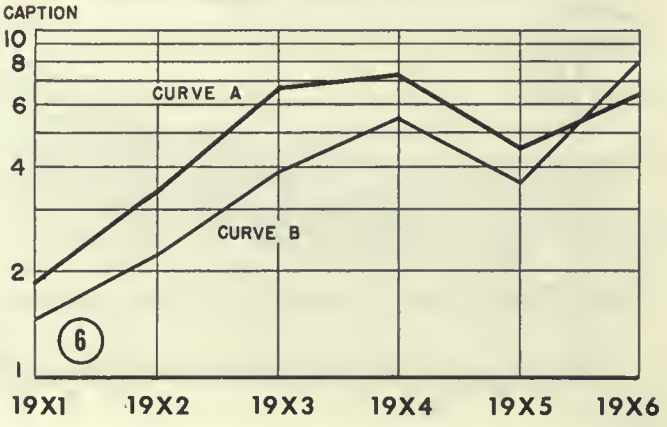
SUPPLEMENTARY AMOUNT-SCALE CHART



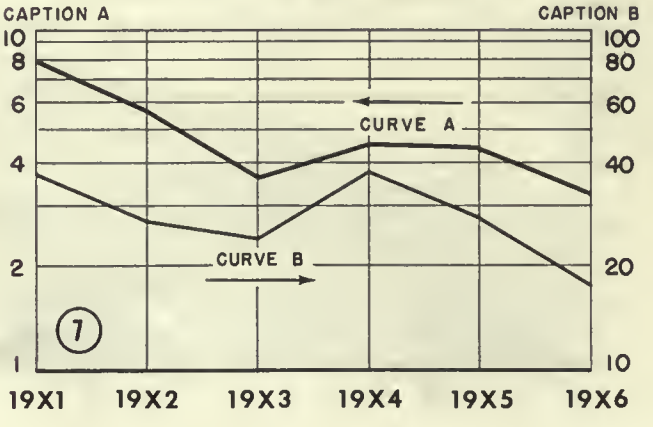
INDEX - SCALE CHART



LOGARITHMIC AMOUNT-SCALE CHART



MULTIPLE - LOG AMOUNT - SCALE CHART



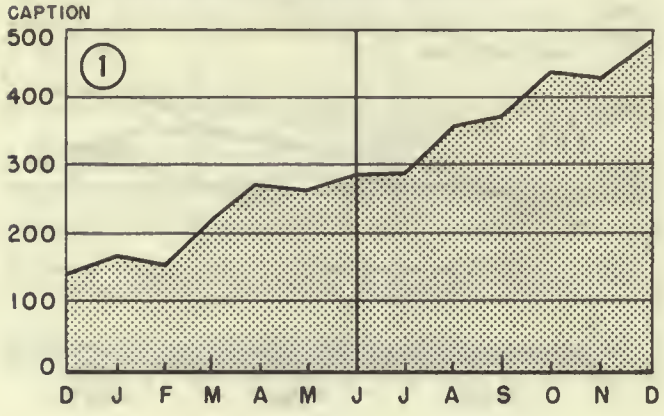
SURFACE CHARTS

Surface charts are shaded curve charts. Some serve the same general purpose as similar curve charts; some perform duties that curve charts cannot do at all. Some are extremely simple, some not so simple. Several types of surface chart are among the most useful charts for showing time series data; but they are also among the easiest to use improperly.

The first thing to note about surface charts is that they are not area charts: in an area chart, each amount is shown as an area (the product of two dimensions); in a surface chart each plotted point represents a linear distance (a measurement in one dimension). Shading the space below the curve connecting these points produces a shaded area; but not an area chart. (For a discussion of area charts and why they seldom are suitable for statistical presentation, see page 62, "Graphic Types Not Recommended.")

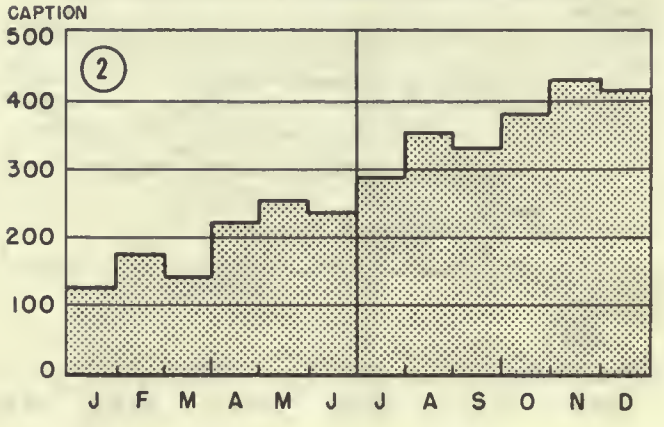
Broken scales should never be used on surface charts because they distort the picture and can give a false impression of the data.

SIMPLE SLOPE-SURFACE CHART



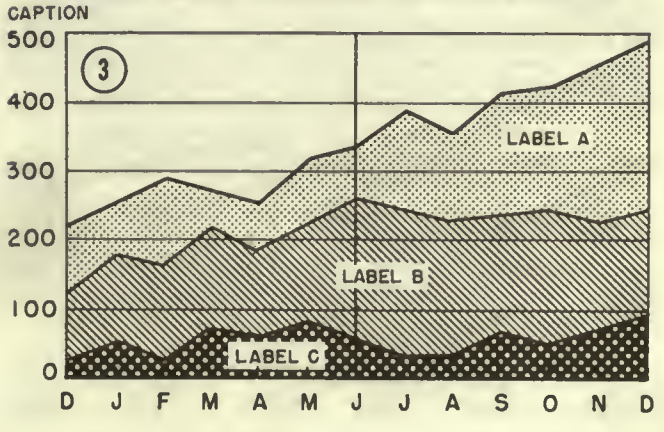
(1) A SIMPLE SURFACE CHART is merely a single-curve chart with the space between the curve and the base line shaded to form a surface. This type of chart emphasizes the size of the total amounts rather than the differences or changes in amounts, and is often used to make a simple growth curve look more impressive. Chart 1 is a simple slope curve that has been converted into a surface chart.

SIMPLE STEP-SURFACE CHART



(2) Chart 2 shows the same treatment applied to a step curve (see page 46 for use). This form of step chart is similar to the connected column chart and can be used in place of it when the time series is a long one (see "Connected Columns," page 91).

SUBDIVIDED SLOPE-SURFACE CHART



(3) A SUBDIVIDED SLOPE-SURFACE CHART shows how the component parts of a time series combine to make the total. This type, which is also known as a layer chart or strata chart, is widely used in statistical presentation.

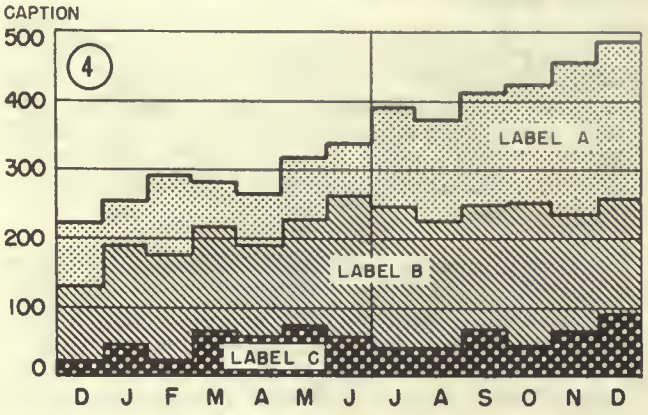
Only the bottom layer of a subdivided surface chart is measured directly from a fixed base. All other layers are measured from a changing base, and their size can be read only indirectly. For this reason, it is usually best to put the most important component at the bottom. However, the size and shape of the bottom layer have such a great effect on the other layers, that it may not always be best to put the most important component first: if this or any other layer fluctuates sharply, it should be put on top. This problem is discussed further on page 73.

Although subdivided surface charts can be very effective, the weaknesses of this type of presentation call for caution in using it (see "Development of Charts from Tabular Data," page 68, for suggested alternatives).

(4) A SUBDIVIDED STEP-SURFACE CHART serves the same general purpose as the subdivided slope type, but is a better form for data that move up or down sharply.

When there are only a few time plottings, step presentation is effective for showing "during" data, as against "as of" data. It is especially good for showing such measures as a monthly average during the year, daily average for the month, etc. Like all step charts, this one is an intermediate type between slope curves and columns and has some of the advantages of each.

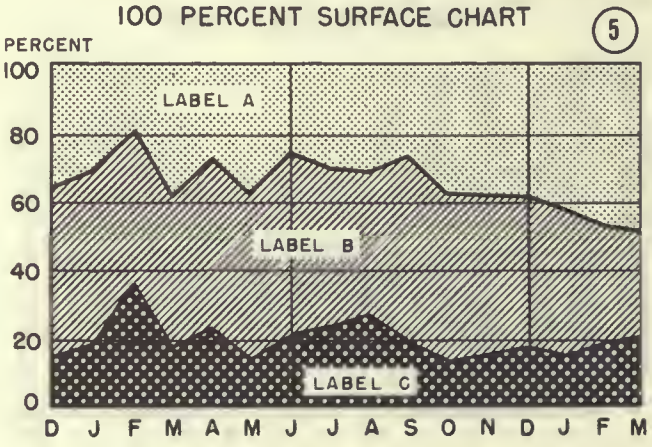
SUBDIVIDED STEP-SURFACE CHART



(5) A 100 PERCENT SURFACE CHART is a subdivided surface in which the layers are shown as percentages of the total. This type of chart shows the change in the relative size of the components, over a period of time. Like all percentage relationships, this one can be misleading if the absolute amounts the percentages are based on are not fairly stable. For example, if 100 percent represents a sharply rising total, a decreasing percentage may actually represent an increasing amount. In such cases, there is a special advantage in picturing the absolute amounts in an accompanying chart or table.

This type of chart can be presented in step as well as in slope form. One of these types is about as good as the other, but the step type is better if the layers change abruptly in either direction or size.

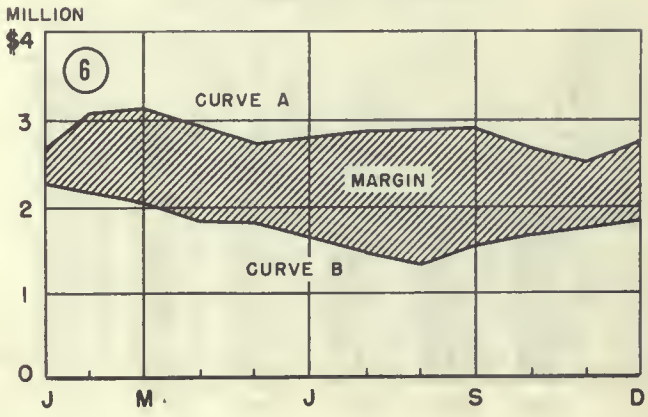
100 PERCENT SURFACE CHART



(6) A BAND CHART compares two closely related curves and emphasizes the difference between them. It is useful for showing the spread between such things as cumulative expenditures and obligations, cost of an item before and after addition of equipment, or a total excluding and including a certain category. Note that in each case one measure must always be greater than the other.

This type of chart is one form of a range chart. The range-column chart on page 53 is another. Both serve the same general purpose of showing differences between two series as well as their absolute magnitudes.

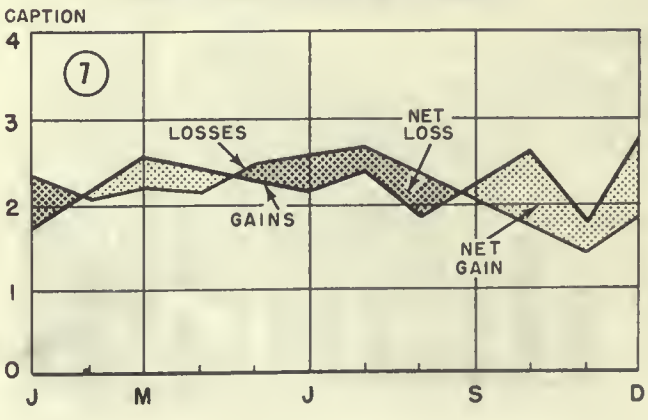
BAND CHART



(7) A DEVIATION-CURVE CHART compares gains and losses and emphasizes the difference between the two. It is a useful type of chart for showing inward and outward movement such as receipts and shipments, income and expenses, personnel accessions and separations, etc.

Like the band chart, this chart shows two curves with the space between them shaded to show how much one exceeds the other. But in this case the curves can cross: so the difference between them can have two meanings: a net gain, or a net loss. Contrasting shadings are used to set off the net gains from the net losses. Other ways to show this kind of comparison are illustrated on page 53, "Column Charts" and page 59, "Combination Types" (Chart 4).

DEVIATION-CURVE CHART



214-853 O - 66 - 4

COLUMN CHARTS

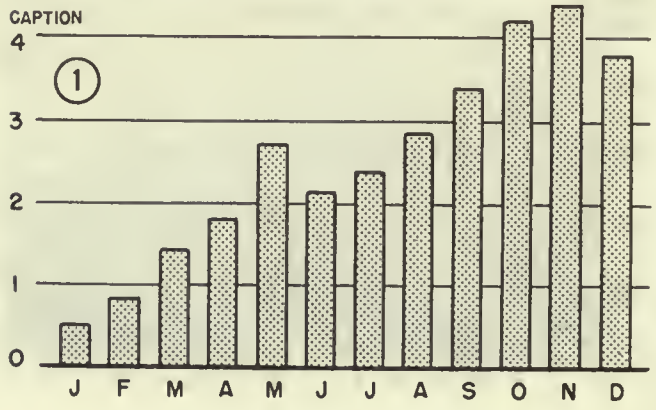
In column charts amounts are represented by the height of vertical bars or "columns." Column charts are generally used to compare data for a given item at different times. Horizontal bar chart (discussed on pages 54-57) are generally used to compare data for different items at the same time.

Column charts are more suitable for data on activities or events that occur during a period of time (such as procurement during April) than for figures indicating status on a given date (such as inventory or strength on 30 April). Figures indicating status may be shown as column charts but usually they can be presented better by curve or surface charts, which are discussed on pages 46-51.

A column chart makes a stronger picture than a curve showing the same data and so is especially good for showing growth or development in a striking manner. Columns are usually better than a curve when there are only three or four time points to be plotted, or when the series fluctuates very sharply.

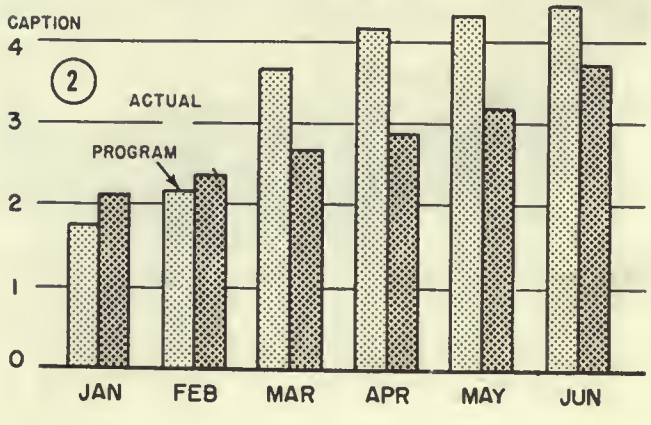
They are not the best form for comparing several series of data, for showing a long series of data with a great many plottings, or for showing numerous components of totals. (See also: "Planning and Designing Charts," pages 73 and 74, and "Chart Construction," page 91.)

SIMPLE COLUMN CHART



(1) A SIMPLE COLUMN CHART consists of a series of vertical bars, each extending from the base line to a plotted point. This type of column chart - and all types developed from it - must have a zero line. Since the entire height of the column is needed to show the size of the amount the column represents, the top end of the column should never be broken except for very occasional "freak" values. (See also: "Broken Columns," page 89.)

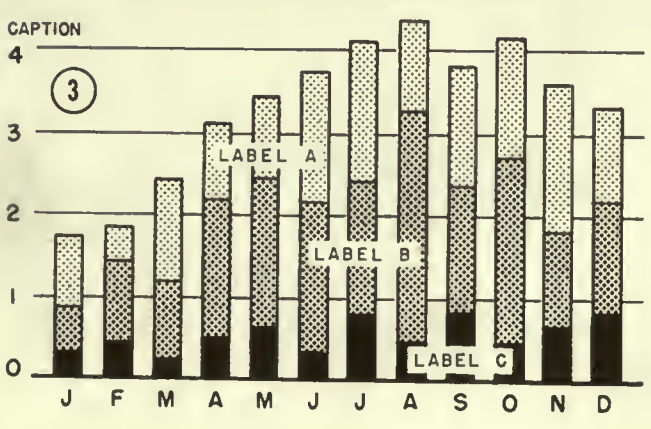
GROUPED COLUMN CHART



(2) A GROUPED COLUMN CHART is useful for comparing two (seldom more) series of data. This type is most effective when used for series that differ in level or in trend. To set off each group of columns from the next, the spacing between groups should be at least as wide as a column (see page 90). The two sets of columns should have shadings that contrast sharply in tone.

Sometimes this type of chart is drawn with one column in each pair overlapping the other; but this treatment should be used only when needed to save space and when the front set of columns is always shorter than the back set. (See "Overlapping Columns," page 91.)

SUBDIVIDED COLUMN CHART



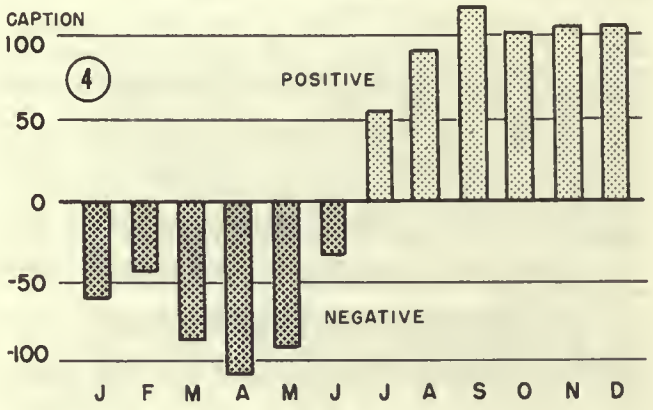
(3) A SUBDIVIDED COLUMN CHART shows the component parts of a series of totals. This type of chart - also known as a segmented column chart - serves the same purpose as the subdivided surface chart (pages 50-51) but is a better choice when the plotted values fluctuate sharply from one period to the next.

There is a tendency to show too many components in this type of chart. When more than three or four segments are used, individual pieces are difficult to identify and to compare. If a large number of component parts must be shown, the subdivided surface chart is usually better. (See also: "Subdivided Surface Charts" page 73.)

As a general practice, do not connect segments in adjoining columns by diagonal lines; such lines usually do more to confuse than to clarify.

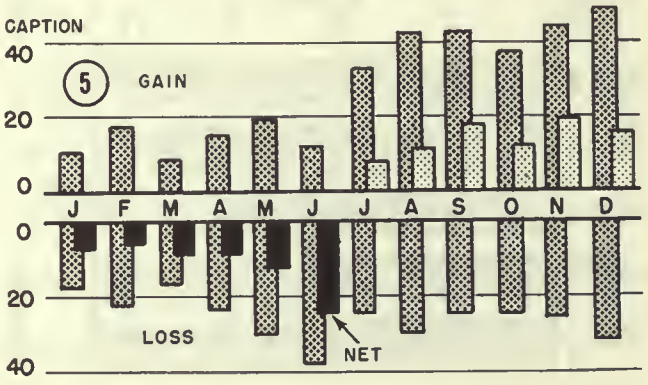
(4) A DEVIATION-COLUMN CHART shows differences between two series. Such charts generally present negative values plotted below the zero line as well as positive values plotted above it. In a deviation chart a column can extend either above or below the base, but not both. This type is good for showing how much results varied from an estimate or requirement. It is especially useful for measuring net gains and losses, and all similar plus-or-minus differences. Chart 4 shows a typical example.

DEVIATION-COLUMN CHART



(5) The significance of net results is often clearer when they are compared directly with the gross figures from which they are derived. For example, in Chart 5 columns extending up from a base line might represent such data as receipts and those extending downward might represent shipments. The difference between each pair of columns is the "net", which appears as an overlapping deviation column, above the zero line if receipts exceed shipments, below if shipments exceed receipts. This type of comparison can be shown also by a column and curve combination (see Chart 5, page 59).

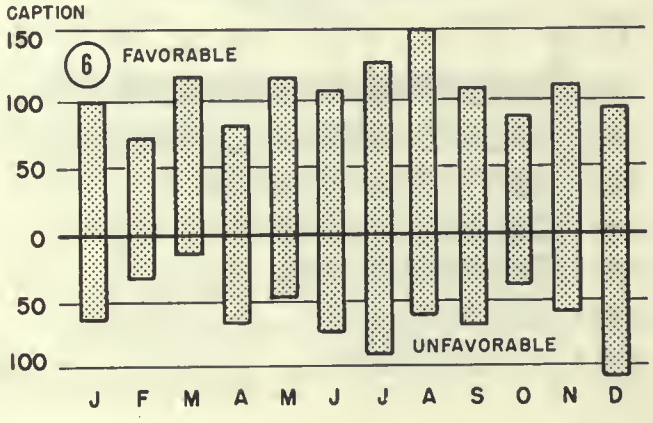
GROSS AND NET DEVIATION-COLUMN CHART



(6) A FLOATING COLUMN CHART is a special variation of the subdivided column type. The total length of the column represents the total of two main components, one of which is plotted above the base line and the other below (often considered to carry an unfavorable connotation). For example, the total length of the column might represent the total number of contracts completed during a month, the portions above the base line indicating the number completed on or ahead of schedule and the portions below the base line indicating those completed behind schedule.

This type of chart differs from the deviation type in that each column may extend both above and below the base. In effect, floating columns are subdivided columns with the dividing line between segments used as the base. The over-all lengths of the columns are subordinated to the comparisons of the segments.

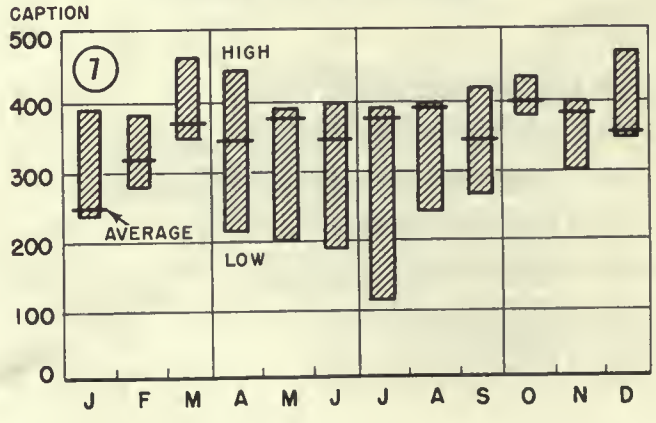
FLOATING COLUMN CHART



(7) A RANGE-COLUMN CHART emphasizes the differences between two sets of values. In this type of presentation the highest and lowest values during each period are connected by a column measuring the high-low range. Supplementary information, such as the average value, can be readily included by means of cross-lines or other indicators. This type of chart is useful for showing the spread in such data as personnel strength, inventories, prices, etc.

As with all charts measuring range (see the surface chart and bar chart versions of this kind of comparison, pages 51 and 56), this type can be used effectively to show a supplementary range such as high and low tolerance limits, upper and lower levels of efficient operation, or other top and bottom "bench" marks. These are usually put in as light dash or dot lines across the entire chart.

RANGE-COLUMN CHART



BAR CHARTS

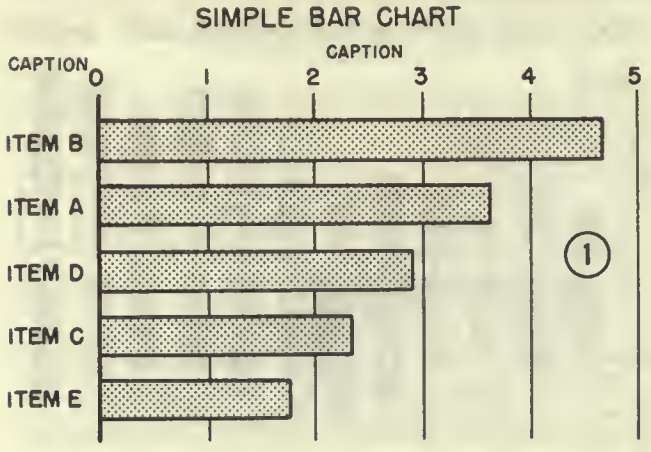
In a bar chart, amounts are represented by the length of horizontal bars. Bar charts differ from curve, surface, and column charts in that they have only one scale. This is an amount scale, and it measures across the chart; the vertical dimension is used for listing the items measured. The horizontal direction of the bars presents a direct contrast to the vertical arrangement of columns, and thus shows the reader at a glance that he is not looking at a time series chart.

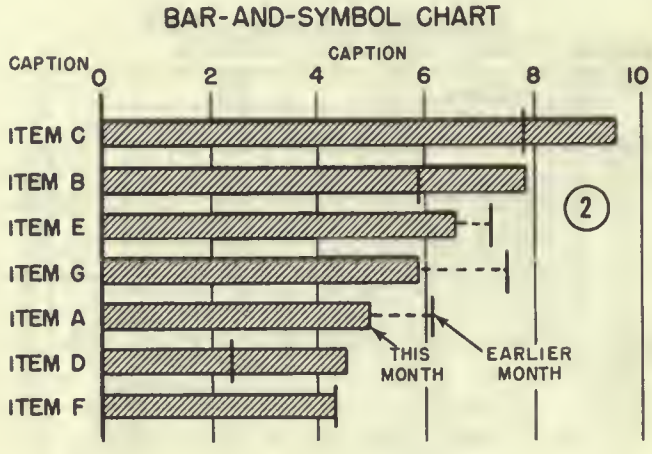
All bar charts (except one type, shown on page 56) need a zero line or other base line. The bars should not be broken except to avoid a long "freak" bar (see page 89).

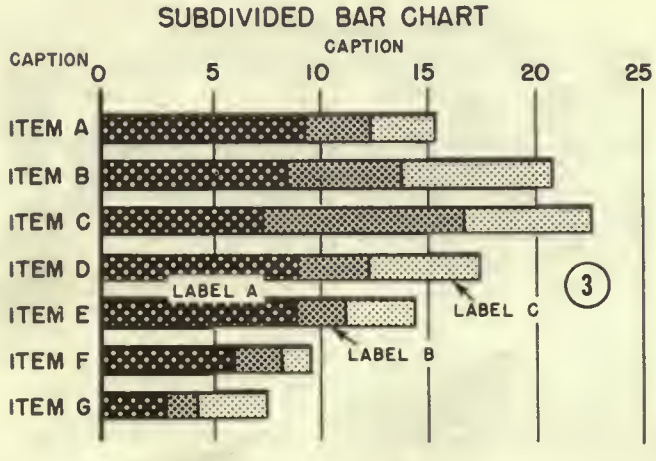
Bar charts may be used effectively to show how several items differ from each other in one or two characteristics, or to show how several items differ from each other in the distribution of their components.

The order of the items in a bar chart is very important. Many kinds of items can be listed in several different ways, each giving a different emphasis to the data (see pages 22-25 of the Tabular Presentation chapter and page 71 of this chapter). The thickness of the bars has no measurement value and so should be uniform throughout the chart.

A further discussion of bar chart treatment appears on pages 71 and 72.







(1) A SIMPLE BAR CHART is merely a series of horizontal bars drawn to the right of a common base line. Each item may be plotted according to its absolute value, or may be expressed as a percentage of an appropriate total, goal, average, or other standard; for example: actual as a percent of scheduled deliveries. A single shading should be used for all coordinate bars, but a bar used to show a different category, such as a total or average, may be set off from the other bars by a different shading or by additional space between bars.

(2) A BAR-AND-SYMBOL CHART is a simple bar comparison with a secondary comparison added. The additional data, such as programed amounts, forecasts, averages, plans, or other standards, greatly increase the value of the chart.

The symbols can be used also to show data for some earlier time: for example, the preceding month or year, or the best previous performance. Thus this type of chart can often be used to summarize several time series charts.

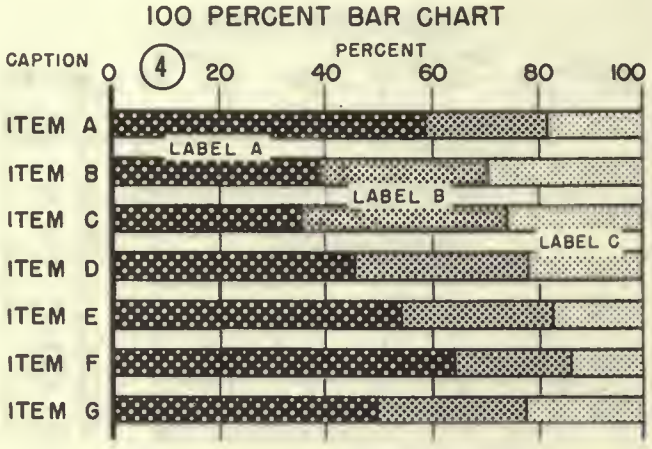
Adding two sets of secondary data is seldom satisfactory because the symbols usually intermingle. However, if one set always represents smaller amounts than the other, two such supplementary comparisons may be effective.

Different symbols may be used in this type of chart to emphasize different comparisons: to emphasize the bar comparison, use vertical cross-lines (as in Chart 2) or some other subordinate device such as a hollow diamond; to emphasize the comparison of each bar and its symbol, use black diamonds, filled circles, or some other prominent device. (The cross-line is the best for general use: it is easy to make, and marks the plotted value more precisely than fatter symbols. See also page 71 for further discussion and illustrations.)

(3) A SUBDIVIDED BAR CHART shows each bar divided into its component parts. This type clearly shows how much effect each component has on the size of the total. Usually the largest or most important component is put next to the zero line. As in subdivided column or surface charts, only the component that starts from the base can be measured directly from the scale.

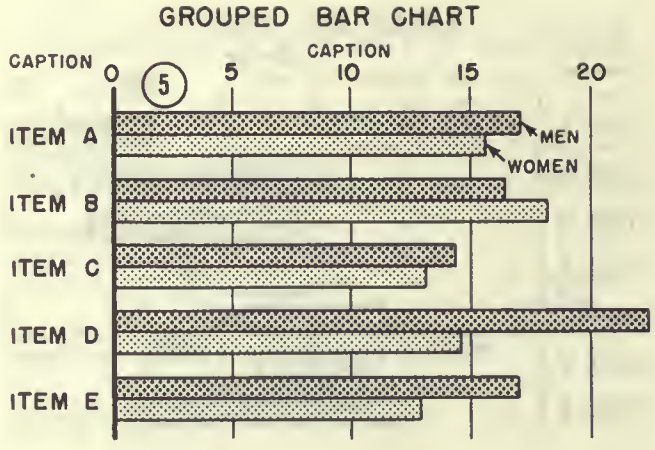
(4) A 100 PERCENT BAR CHART shows each bar divided according to the relative size of its components, regardless of the absolute size of the total value of the bar. It emphasizes the proportionate part of the total contributed by each component.

This form of subdivided bar has the advantage of having two base lines: zero and 100 percent; and so provides direct comparison of the components at either end of the chart. Like other percentage comparisons it should be used with caution when there is a wide difference in the absolute amounts on which it is based.



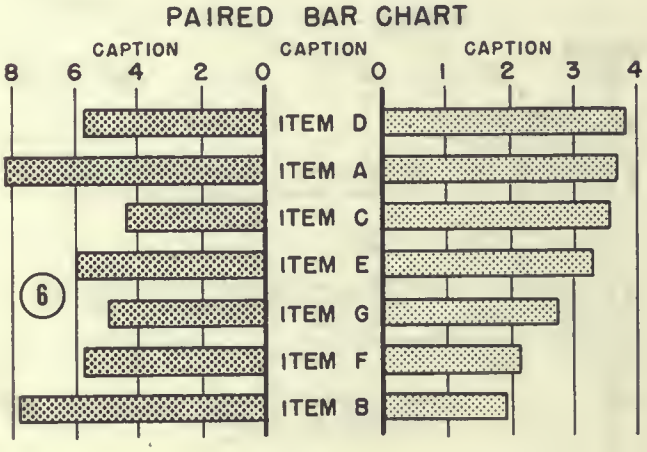
(5) A GROUPED BAR CHART permits the comparison of a number of items in two respects at the same time. Although the bar-and-symbol treatment can be used to present this kind of information, grouped bars are better, when space permits, because they suggest the nature of the comparison better. Groups of more than two or three bars are seldom desirable because the eye is confronted with too many comparisons at once.

In designing this chart, the category of major interest is usually put first and given the darker shading. For spacing, the standard is to make the space between groups no less than the thickness of a bar. (An easy way to lay out this chart is to make the space between pairs the same as each bar.) See also "Overlapping Bars," page 91.



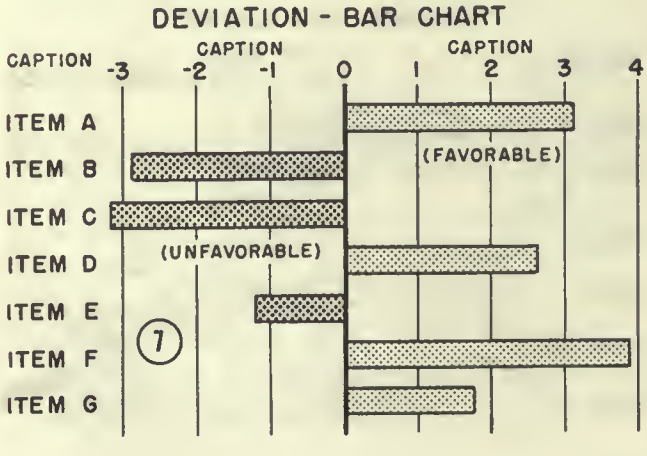
(6) A PAIRED BAR CHART is another way to compare a number of items in two respects. It is preferable when different units or scales must be used for each category. Instead of being grouped, the bars are put opposite each other, one set extending to the left of the item names, one to the right. In this chart, the bars at the left might represent cost per unit and those at the right the number of units produced; or number of motor vehicle accidents per 100,000 miles and number of miles operated.

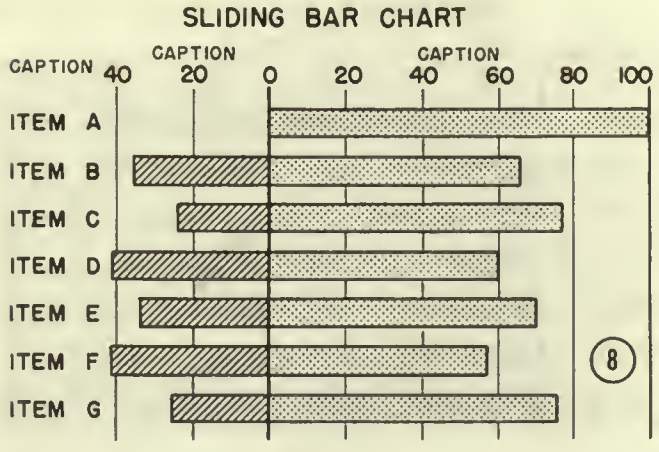
Bars extending to the left (like columns extending below the zero line) tend to suggest unfavorable results or conditions. If the nature of the data permits, the chart should be designed to take advantage of this.

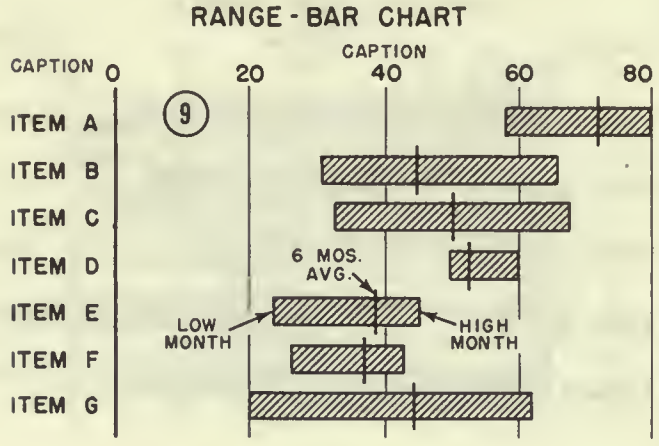


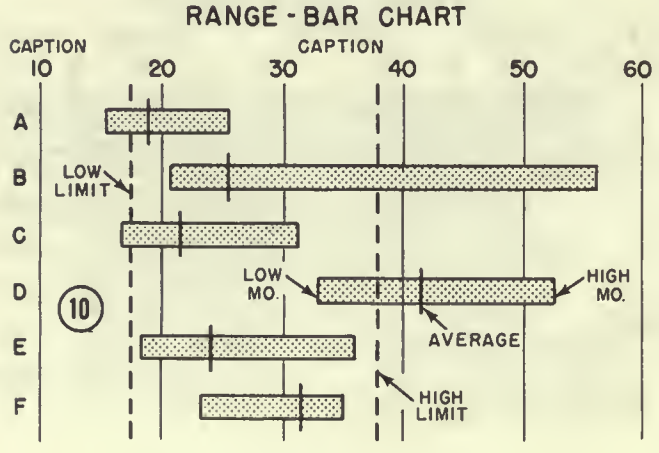
(7) A DEVIATION-BAR CHART also presents bars extending to the left and right; but in this case each item has only one bar, and it goes to the left or right. This type of chart is useful for comparing differences between actual results and a program or standard, especially when these differences are so small that they would be hard to compare on a chart showing the totals.

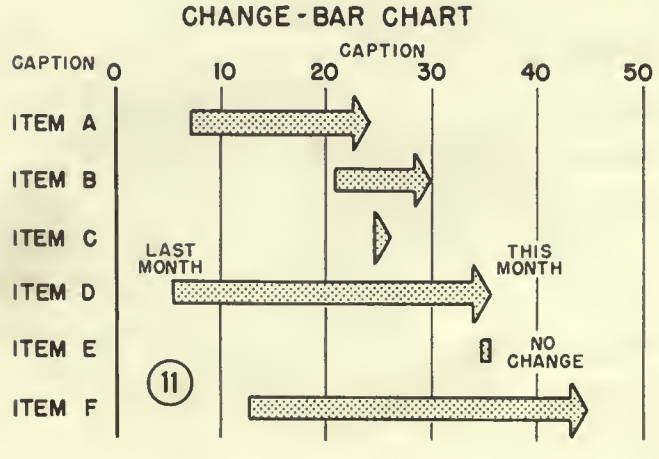
Chart 7 might show any kind of "more-than-less-than" data, such as amount over or under allowance, percent over or under estimate, etc. Like any deviation chart, this type is effective also for showing other net measurements such as net gains and net losses, or net ins and net outs.











(8) A SLIDING BAR CHART is a special sort of subdivided bar chart. The length of the bar represents the total of two main components, one extending to the left and one to the right of the base line. For example, personnel might be divided into military on one side of the base and civilian on the other; or the quantity of an item in storage divided into ready for issue and not ready.

The main advantage of this sliding treatment is that both of the components can be measured directly from a common base. This chart, therefore, is primarily a comparison of parts, with the comparison of totals secondary: a conventional subdivided bar is primarily a comparison of totals.

Sliding bars can be used to show either absolute or percentage values. The two segments of the bars can be shaded differently and even subdivided further if appropriate.

(9) A RANGE-BAR CHART shows the range or spread between low and high amounts rather than just the size of single amounts. In effect, a range bar is the result of placing one simple bar on top of another: omitting the part where the shorter overlaps the longer leaves a range bar.

Range bars do not start from a common base, and so cannot be compared directly; instead, they show the size of each range in relation to the two amounts it separates. This sort of presentation is useful when interest is in the amounts at each end of the range as well as in the difference between them.

By adding a cross-bar (or some similar device) to a simple range chart, this type of chart can show a comparison of averages, plus the range of values behind these averages. Such a chart often tells a lot more than one showing only the averages.

(10) Sometimes the value of a range chart can be increased further by adding still another set of measures, such as goals or tolerance limits. Illustration 10 shows one version of this added feature. It would be possible - under certain special conditions - to go a step further and subdivide these range bars, but this might well make the chart too cluttered to be understood easily.

(11) CHANGE-BAR CHART. By adding a direction indicator, such as an arrowhead, the basic range bar form can be used to show change instead of simple range. The addition of the pointer not only tells which end of the bar marks the current result, but also tells whether the change is an increase or a decrease. Unfavorable changes (whether decreases or increases) are usually shown as black bars to make them stand out clearly from favorable changes.

This type of presentation is not necessarily limited to showing change from one time to another. The bars might show such information as original and revised programs for various items, or performance before and after adoption of new methods or procedures.

(12) Sometimes a third set of values can be added to this chart with profit. For example, the addition of an objective or some other bench mark might help put the current performance into better perspective. Illustration 12 shows how this idea can be used, even when the objective is a range instead of a single value and is different for each item.

It is occasionally useful to add still another set of values, such as the best previous performance or an estimate for some future period; but this may make the chart cluttered and confusing unless these data fall into a clear pattern and do not scatter all over the chart. A small circle - about one-half the width of the bars - is usually the best symbol for such data.

Like every other type, this chart has its limitations; but it is an effective means of showing which way things have been moving, how far they have moved, and where they now stand.

(13) A PROGRESSIVE OR STEP-BY-STEP BAR CHART is an unusual form of subdivided bar chart. It shows the segments of a bar as a series of steps one below the other. This treatment calls attention to one step at a time and emphasizes the number of steps involved. Putting the pieces one under the other in this way also permits easier and fuller labeling, which is especially helpful when the labels are long descriptive captions.

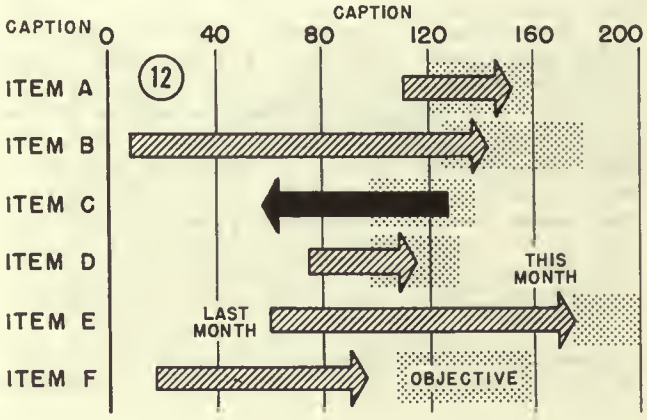
The step-by-step method can be used either to build up a total or to break it down. For example, it could show how several sources of funds add up to the total available, or how the total available has been used.

(14) The adding and subtracting steps can be combined to show a complete cycle of operation or performance. This type of chart is especially useful for taking a close look at the status at the start of a period, the steps that affected the status during the period, and the status at the end of the period. For example, this two-way chart might be used to explain changes in the quantity in storage of an item of equipment.

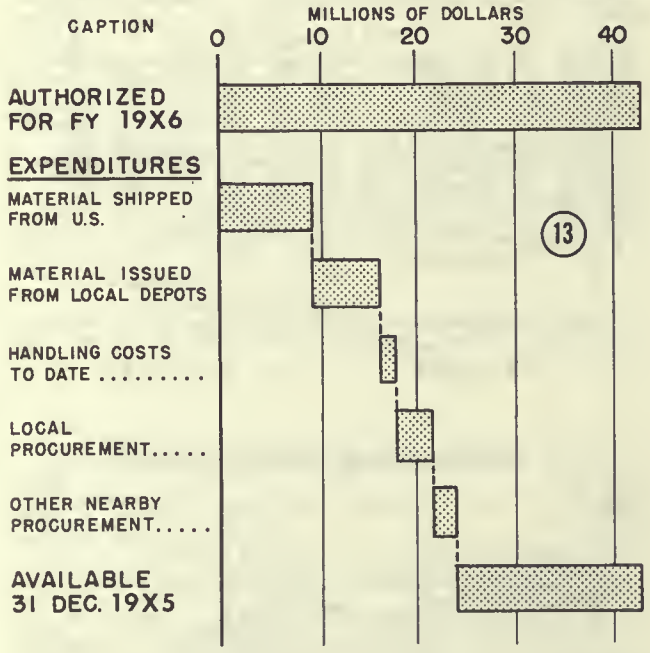
The pieces do not have to be sorted to show first the inward steps, then the outward. When appropriate, the steps can progress in actual order of occurrence. For example, this type of chart could be used effectively to show a succession of program changes such as: increase, decrease, decrease, increase, etc.

NOTE: Step-by-step presentation uses much more space than conventional subdivided bars: it should not be used unless the nature of the data and the importance of the subject warrant it. Make sure also that the pieces are really progressive steps, or at least have a logical sequence. Do not use this type of chart just to add novelty to a simple subdivided bar; and especially do not use two progressive bar charts when one chart comparing two subdivided bars will tell the story just as well.

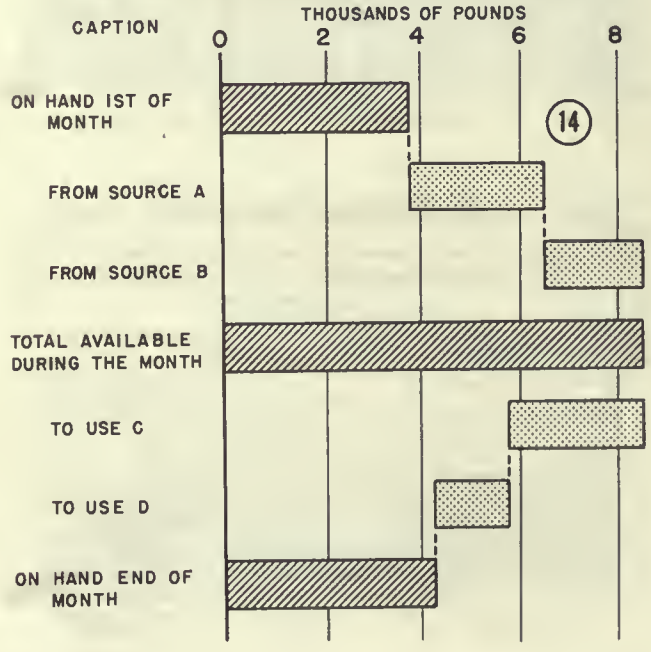
CHANGE-BAR CHART



PROGRESSIVE OR STEP-BY-STEP BAR CHART



TWO-WAY PROGRESSIVE BAR CHART

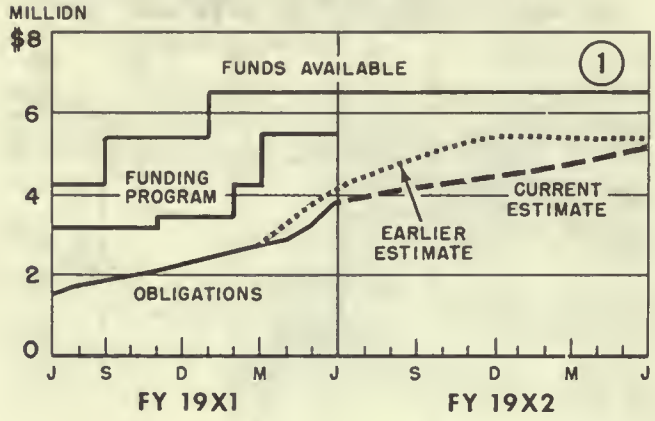


COMBINATION TYPES

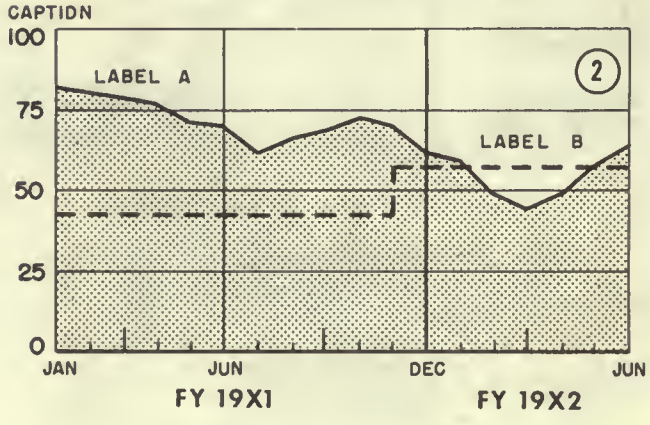
By combining basic chart types a chart can often be devised that will fit the data better than any of the basic forms. The illustrations on these two pages are typical examples of how combination types can be developed. They show how these special forms can help to bring out more clearly the particular comparison the analyst wants to show. Of course, these are only some of the many variations possible: other data and other needs will suggest other ways to combine the basic types. As mentioned earlier in this chapter, however, avoid charts that are so complex and so obscure that they discourage, rather than invite the reader's interest.

Combination types should serve a definite purpose other than novelty: do not use them just to be different or just for variety. Do not use them with the idea that combination types are always better than the basic types: they are not. Also, be consistent: always use the same kind of combination for the same kind of comparison.

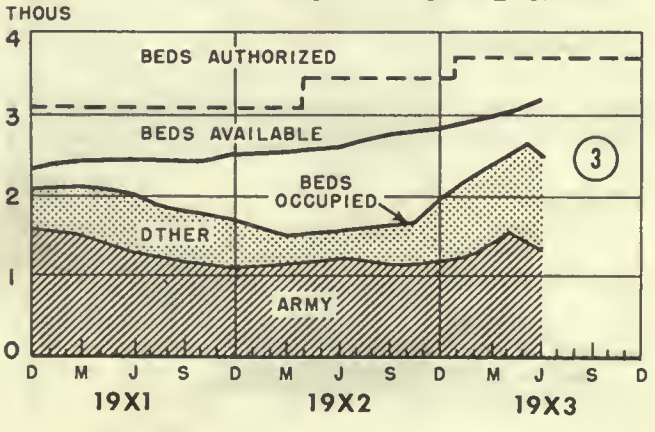
SLOPE AND STEP-CURVE CHART



SURFACE AND CURVE CHART



SUBDIVIDED SURFACE AND CURVE CHART



(1) SLOPE AND STEP-CURVE CHART. Slope curves and step curves can often be combined to make a more effective chart than either kind alone. The example at the left shows a typical use of this sort of combination. Notice that the step curves are used for data that change abruptly from one level to another; and that the slope curves are used for data that change more or less continuously.

CAUTION: Do not use the two types of curve together unless the data require it. A step curve used just for variety will usually make the chart confusing instead of more revealing.

(2) SURFACE AND CURVE CHART. There are many uses for a chart combining a surface and a curve. For example, a curve representing a standard or requirement can be combined with a simple surface chart showing actual performance or results. As illustrated at the left, this is a simple but effective combination chart.

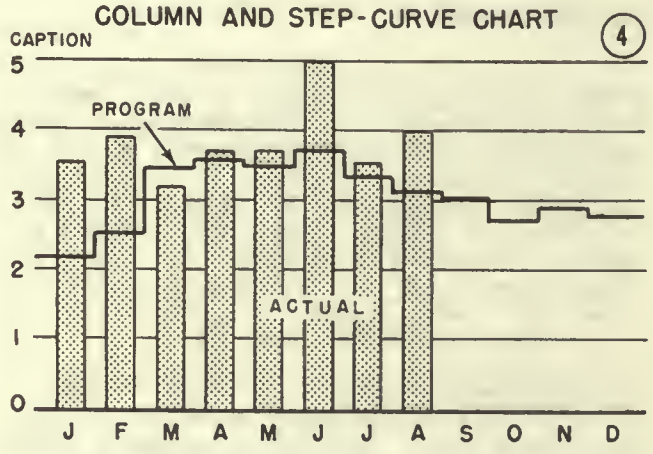
Shaded surfaces should not be used if the two curves shown are close together or if more than two curves would run through the same shaded area.

(3) A SUBDIVIDED SURFACE AND CURVE CHART is a useful combination when it works. Chart 3 shows a good example of how effective this sort of combination can be. This one chart tells the story much more clearly and completely than two separate charts - one dividing occupancy, the second comparing total authorized, available, and occupied.

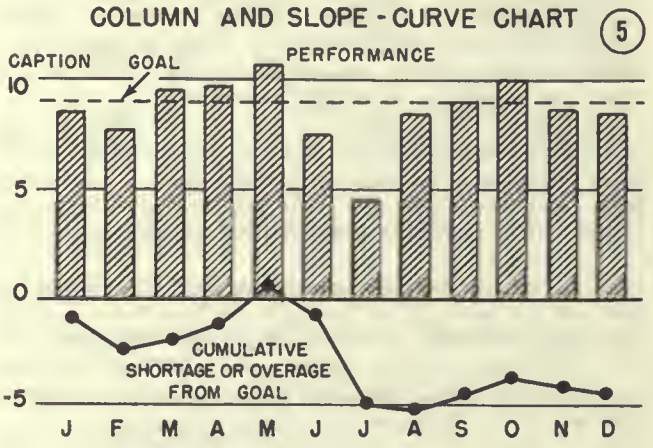
But this type of combination must be handled carefully when a curve runs through the surfaces: when this happens, be sure to make the curve heavy enough (and the curves outlining the surfaces light enough) to set it off clearly from the background. If more than one curve runs through the shaded surfaces, or if there are several bands of shading, this type of chart may become confusing unless the curves follow a pattern quite different from the shaded bands. Even then, extra care is necessary to arrange the labels so that there is no question of which labels what.

(4) A COLUMN AND STEP-CURVE combination is sometimes a more logical way to show two series than two curves. This form is especially suitable for comparing actual and program data, or for showing two different kinds of things. For example, columns could be used to show actual numbers of students in training while a contrasting curve might be used to show the number programed.

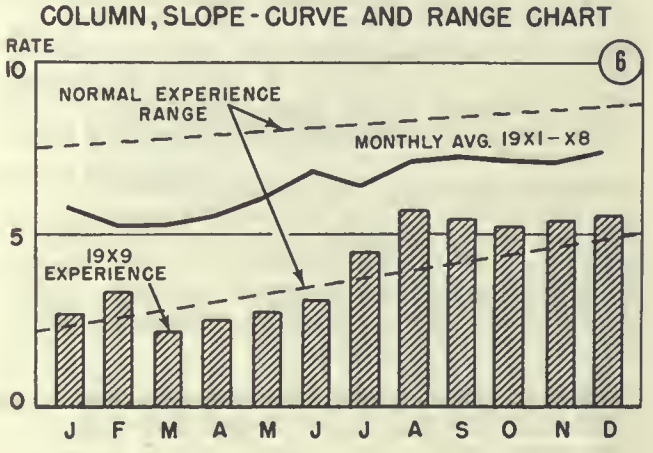
When a step curve is combined with connected columns (see page 91), it is important to make it heavy enough to look like a curve: otherwise it will seem to be only a separator line that divides the columns into segments.



(5) A special column and curve combination which has proved very useful is illustrated at the right. In this type, columns are used to measure results for each period against a standard or goal (shown as a straight line or step curve). A slope curve showing the cumulative difference between results and goal is then superimposed. This type of chart shows at a glance the results for each period and the total effect of these results to date. It is especially good for comparing actual expenditures and a budget or program.



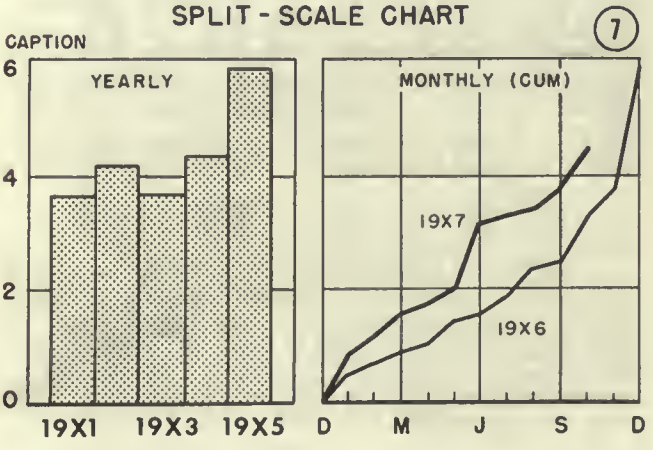
(6) Another useful type of chart combines columns showing current results with a curve showing monthly averages for several earlier years. The dashed lines show the average range of the highs and lows in the earlier period. If appropriate, they could show the extreme high-low range instead of the average range; in which case the lines would be irregular instead of straight. This is a good method of showing how much of the change from one month to the next is merely the usual seasonal change, and at the same time comparing current performance with the level of earlier years. This type of chart is useful for quality control work.



(7) SPLIT-SCALE CHART. This is actually a two-in-one chart rather than a combination type; but since it usually makes use of two types it is included here. The main purpose of such charts is to provide both a close-up of the current period and a quick look at the past (or at the future - with the columns placed at the right of the curves, as illustrated in Chart 3, page 84).

In Chart 7 this type has been used to show current data, cumulated monthly, for comparison with the preceding year and with the total for earlier years. The same kind of combination could be used to show quarterly averages over a number of years as compared with monthly data for the current year, etc. (See page 87.)

This two-in-one type can be used also for non-cumulated data: for example, the current part could show actual monthly production (or strength); the other part, monthly averages for preceding (or succeeding) years. Such a chart, however, can be used only for comparing levels, not trends. Since the time scale for the early (or future) years is very much compressed, it makes trends seem much sharper than on the stretched-out monthly scale.



FREQUENCY CHARTS

Most Army charts are time series charts that present chronological changes in data, such as month-end strength for a five-year period. Frequency charts are needed to show data grouped by size or magnitude. The numbers of military personnel, for example, may be classified in terms of age groups, height, weight, etc. In these examples, the numbers of personnel is called the "frequencies" and the differences between the upper and lower limits of each group as the "class intervals."

Simple Frequency Charts

Each type of frequency distribution chart has its own uses. The slope frequency curve (Chart 1) is usually best for continuous data where differences in the magnitudes within the class intervals are infinitesimally small (such as age and length of service). It is also best when the number of class intervals is large so that the curve is relatively smooth.

The histogram, step, and column forms are good for small numbers of groups or for discrete data (measured in indivisible units) such as number of dependents per family, or pay grades.

Slope curves are generally best for comparing two or more distributions in the same chart. Separated columns are usually best when one or more horizontal-scale units are not included in the distribution and must be shown as an open space.

Most frequency charts show data by groups or class intervals instead of individual units, as illustrated in Charts 1, 2, and 4. When the number of individual units is large, grouping them simplifies the chart and clarifies its meaning. (See page 83 for the number and size of groups and methods of labeling and plotting them.)

Comparing Frequency Distribution

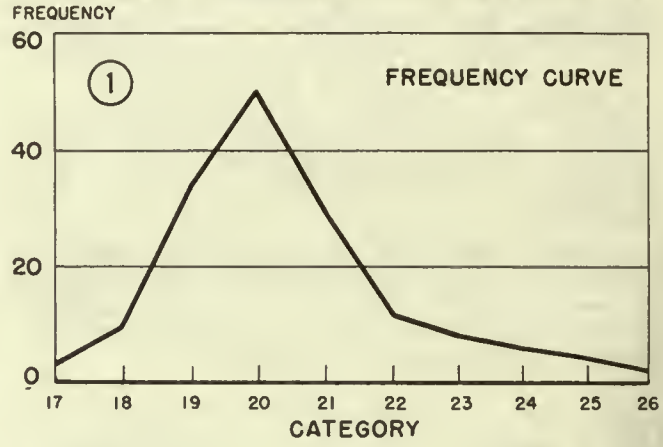
When comparing two or more distributions in the same chart, a scale of absolute frequencies should be used if the purpose is to show simply how many are in each category. If the purpose is to compare the proportion in each category, plot the percentages.

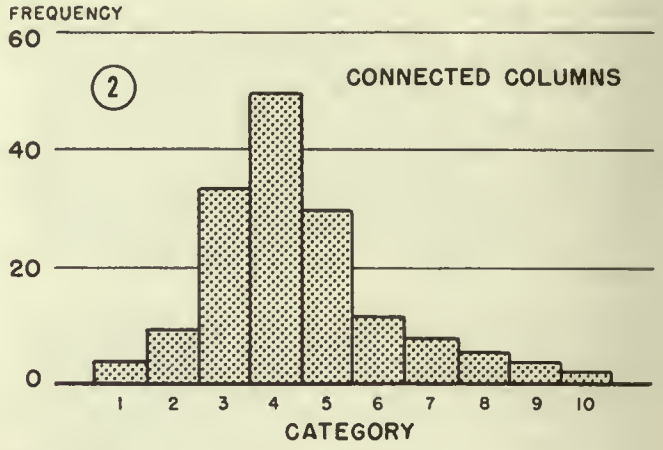
Several frequency distributions can be compared by converting them into subdivided bars (see pages 54-55). This method uses a series of graduated shadings - properly labeled - to indicate the class intervals or individual measurement units. Four or five subdivisions are about as many as can be shown satisfactorily, and so this method sacrifices some detail; but the result is a compact summary chart that is easier to grasp than a series of frequency charts or a series of overlapping curves on a single chart.

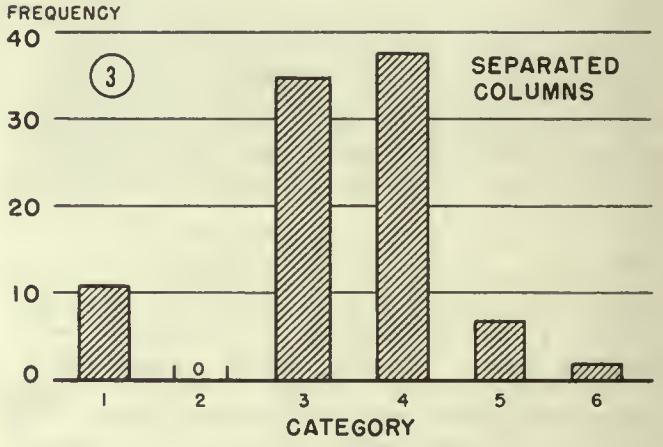
Cumulative Frequency Charts

These are useful for showing how many (or what percentage) of the total frequencies were less than any specified quantity (Chart 4A) or more than any specified quantity (Chart 4B). This type of chart should be used only when it can be clearly explained in the title. (See also page 57, Chart 13.)

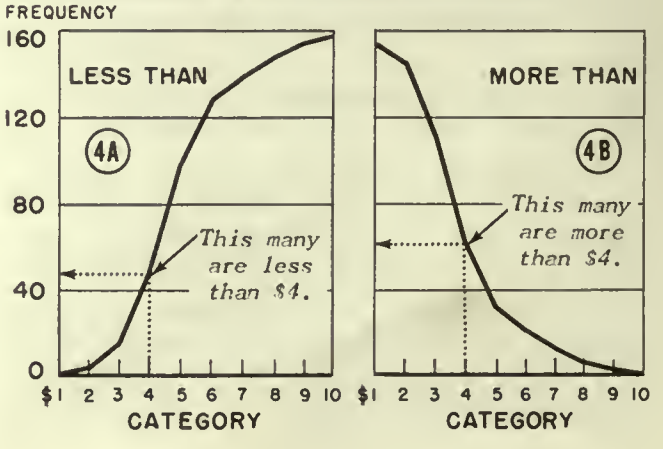
SIMPLE FREQUENCY DISTRIBUTIONS







CUMULATIVE FREQUENCY CURVES



GRAPHIC TABLES

Graphic tables, usually referred to as charts, sometimes may be used to portray statistical data effectively.

In this type of table, the entries are sorted into a few main groups, and a suitable graphic device used to represent each group. This grouping procedure is a form of summarization, and the effectiveness of this type of presentation depends largely on the aptness of the summarizing.

This kind of presentation combines the "picture" value of graphics with the main feature of a tabular arrangement - cross classification - and so provides some of the advantages of both forms. The three examples on this page are particularly good for summarizing a number of more detailed charts or tables.

(1) A STATUS CHART highlights good or bad conditions. It can be used for showing either the quality or quantity of performance or status, production, or inventory. For example, this type of chart could be used to show the status of supply at oversea bases for different types of supply, in which case the key might be expressed in quantities such as "less than 50 percent of allowance," "50 to 99 percent of allowance" and "100 percent of allowance or more." This type of presentation is the most widely useful of all graphic tabulations, and can be adapted to many kinds of tabular data.

(2) A PROGRESS CHART is a graphic check list used to record progress, or lack of progress, through a series of processes, steps, or operations: for example, the progress of a supply item from depot to oversea command.

In using this type of presentation, it is often desirable to show the date of completion of the last completed step or operation. This may be done by putting the date in the last "completed" box for each item.

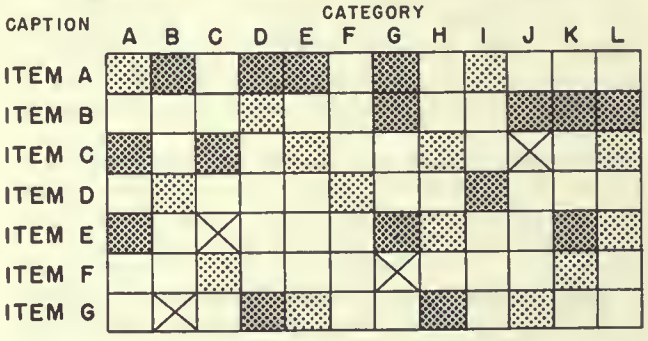
Symbols instead of shadings can be used for charts of this type and are usually better when there are several degrees of progress to be recorded. The "square dial" symbols shown below offer a simple and effective method of showing as many as eight steps:

(3) A RANK CHART compares the status or performance of a number of items in several different respects. In this type of comparison, individual amounts are not shown graphically: instead they are represented in a general way by showing which of a few broad amount-ranges each item falls into. It is usually best to limit these groups to three or four, especially if there are only a few items.

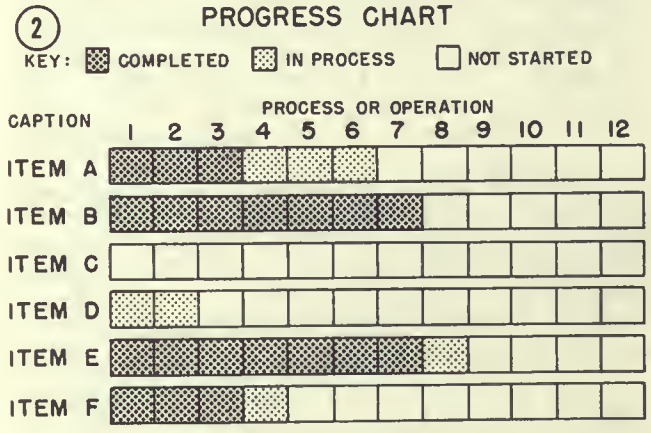
Numbers can be inserted in the blocks to show numerical rank; or, if they can be shown in one or two digits, the actual amounts represented can be inserted. (A good way to do this is to show not total amounts but the difference between each amount and an average or goal.)

The series of columns across the chart can also be used for different periods of time, instead of different categories, as in the progress chart above.

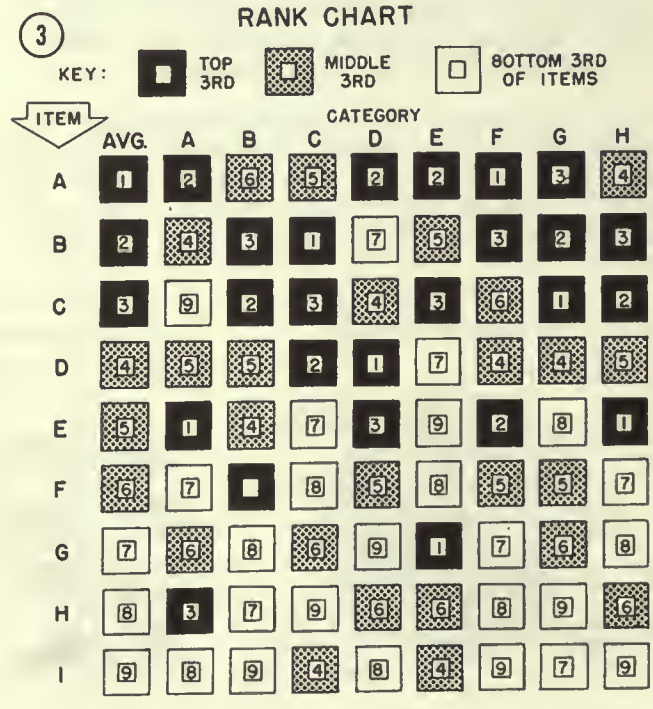
(1) STATUS CHART



(2) PROGRESS CHART



(3) RANK CHART



GRAPHIC TYPES NOT RECOMMENDED

Several types of chart are not generally recommended for use in statistical reports. These are charts that are either too technical for most readers, or are too elaborate to be practical, or are simply not as useful as other types that do the same sort of job much better. Some are appropriate on occasion, but the occasion is determined more by the audience than by the nature of the information to be shown.

Pie Charts

Component parts of totals may be shown as sectors of a circle as well as in the subdivided bar and column forms shown in the preceding pages. This circular type of chart, known as a pie chart, is popular because it appears to be a simple, "nonstatistical" form of presentation. However, since the eye can compare linear distances more easily and accurately than angles or areas, the component parts of a total can usually be shown more effectively in a chart using linear measurement.

The illustration below shows the components of a single total presented in pie and in bar form. The bar comparison is just as clear and can be read with greater accuracy. It shows the first and last components at opposite ends of the chart instead of adjacent as in the pie arrangement. It has a further advantage: the bars may be subdivided, a treatment that usually is not applicable to the pieces of a pie chart.

Pie charts are awkward to label, and do not fit as well on a report page as bar comparisons. Usually the least important component or the "all other" miscellaneous slice is the first thing seen on the chart because its label appears at the upper left edge of the pie.

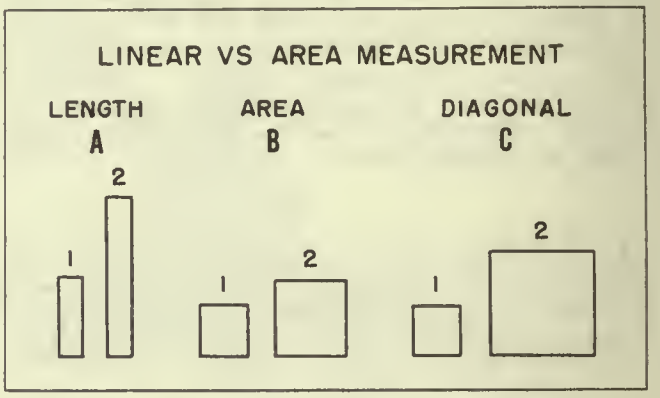
For these same reasons, a series of pies is less effective than a series of subdivided bars (or columns) for comparing a series of subdivided totals. Several pies require much more space than several bars; moreover, the comparable components are often in a different location in each pie and so are hard to compare.

Occasionally pie chart presentation has sufficient special value to warrant its use despite its shortcomings (for example, when components may be added progressively to form useful subtotals). In general, however, some other type of presentation is preferable, especially when the comparison calls for more than one divided total.

As explained under "Area Charts" below, pies of different size should never be used to compare totals of different size. Subdivided bars or columns are always better for this kind of comparison.

Area Charts

Simple bar charts, column charts, and curve charts, (and all other types developed from them) are forms of linear measurement. In certain types, a series of linear measurements may be shaded to form a continuous surface*; but this should not be confused with area measurement, in which each amount is represented by the product of two dimensions.

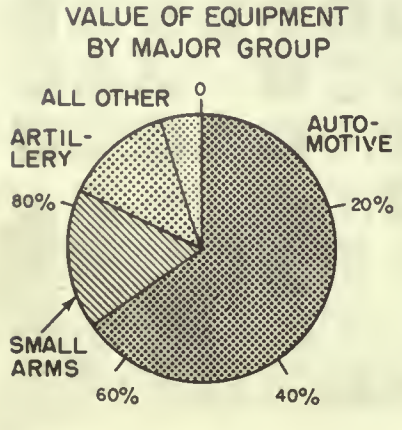


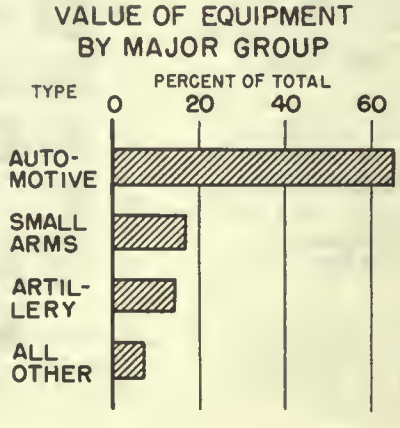
The eye is not nearly as good a judge of area measurement as it is of linear measurement and for this reason area comparisons are not recommended for standard use. As seen in the illustration, area comparison appears to understate larger amounts. In both the linear and area forms shown, the larger is twice the smaller: in the area comparison the difference seems definitely less. This is true no matter what the shape of the areas.

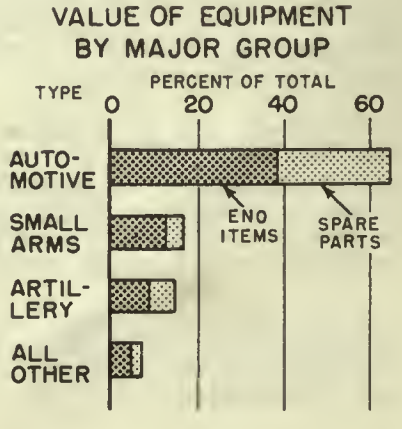
Drawing the areas with their diameters in a ratio of 2 to 1 (instead of their areas) does not remedy the fault but merely carries it to the other extreme: the amount differences then appear to be very much overstated (comparison C).

If areas could be compared accurately, this would seldom be desirable except for the most

* See "Surface Charts," pages 50-51.



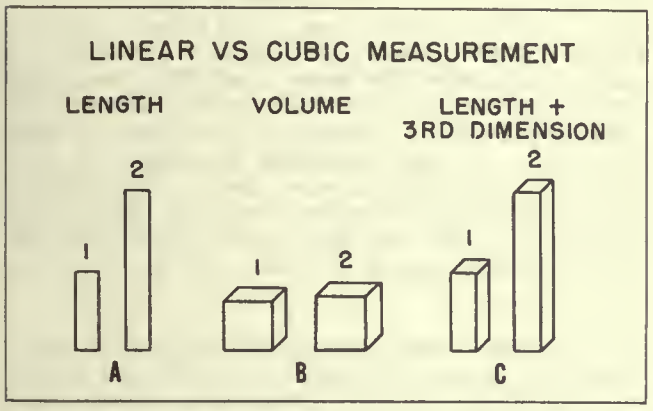




simple comparisons. Area comparisons do not have the economy of linear comparisons since they require several times as much space and they are much more limited than linear comparisons in their range of useful variations.

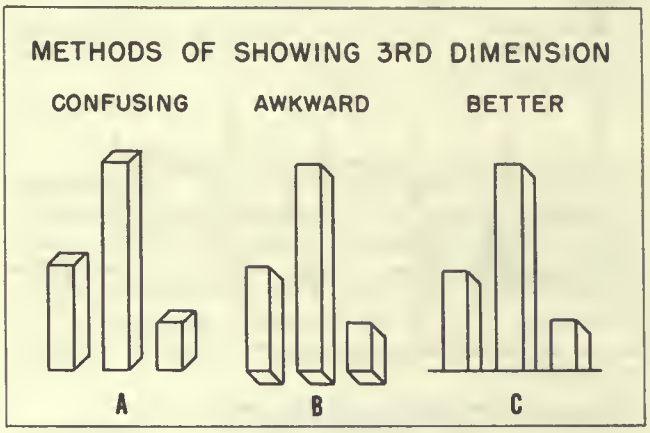
Three-dimensional Charts

Cubes and other 3-dimensional forms are even harder to compare than areas. Since the eye tends to measure the area covered by the silhouette of a cube, the apparent difference between one cube and another twice its volume is very small (comparison B in the illustration).



Even if 3-dimensional forms were easy to read, the difficulty of constructing them accurately would generally discourage their use. In practice, actual cubic measurement is seldom used: instead, a pseudo third dimension is added to an otherwise linear comparison. The intention is to gain the force and novelty of the third dimension while retaining the accuracy of linear measurement. Used with restraint this procedure is often quite harmless.

This "decorative third dimension," however, has several drawbacks as a general treatment: it forces most charts into bar or column form because it is seldom effective for curves; it is usable only for simple charts showing relatively few values; it is often ambiguous in that the reader is not sure whether the front or back edge of the block (or column) is the plotted value. This last problem can be reduced by making the third dimension fairly narrow or by showing the thickness at the base of the bars, where, in effect, it forms a sort of base line. It can be avoided entirely by using a "base line" perspective (this assumes that the eye is on a level with the base line and so sees the front and back of the block as a single line). Section C of the illustration below shows how this is done.



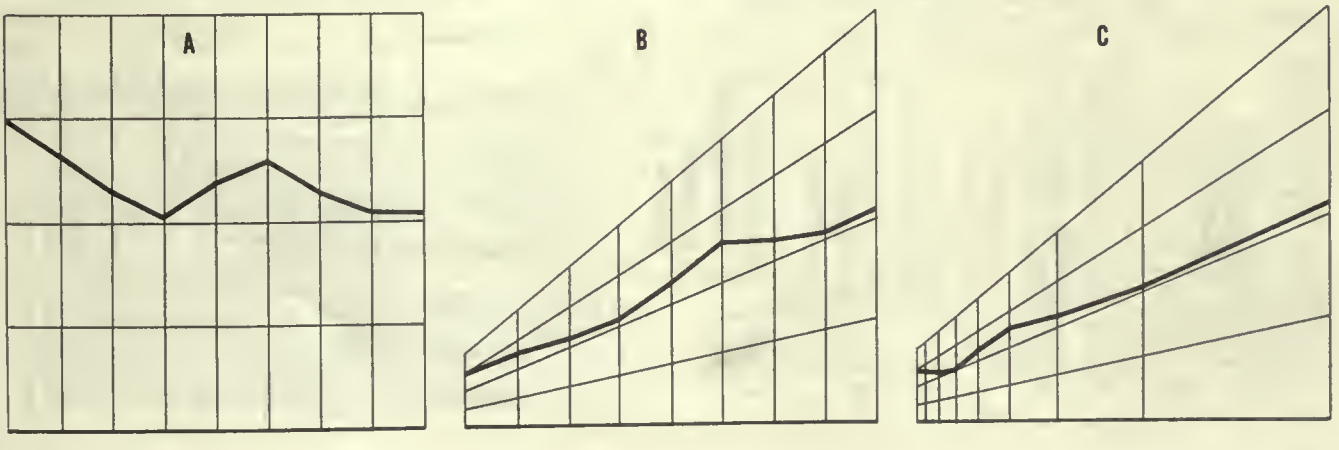
In general, the third dimension should be used only when the picture is a simple one, when differences between plotted values are fairly large, and when the gain in attention value is important enough to offset the extra work and the possible loss in accuracy. If it cannot be used throughout an entire series of charts it should not be used at all. (See also page 76, Chart Style.)

Perspective Charts

Normally charts are drawn in parallel perspective: that is, they are presented "head on", the sides appearing as parallel vertical edges and the top and bottom as parallel horizontal edges (Chart A below). This type of perspective (or lack of it) is almost always preferable to diagonal perspective in which two opposite edges of the chart (usually the top and bottom) appear to converge (Charts B and C).

Diagonal perspective compresses the scale at one end of the chart and expands it at the other, and so distorts the picture. Data presented in this manner are always more difficult to read accurately, and often are misleading.

In fact, the perspective treatment is generally used with the intention of "sharpening" or "softening" the data as the case may seem to require. For example, an increasing curve can be "sharpened" by designing the chart so that it converges to the left; the same curve can be



"softened" by designing the chart to converge to the right. Neither of these images gives accurate representation and obviously, the greater the angle of perspective, the less accurate the picture. In fact, by choosing an appropriate perspective, curves that actually increase can be made to run downhill, and curves that decrease can be made to run uphill.

Perspective plus 3-dimensional Treatment

The attractiveness of the perspective treatment and of the 3-dimensional treatment is increased by combining them; but their faults are combined also. From a purely decorative point of view this method of presentation may be desirable: but if an accurate impression of the facts is important, no poorer way could be found to provide it.

Pictographs

Charts that represent amounts by rows of little men or other pictorial symbols have many strong supporters. In fact, some chartists feel that this is the only way to draw a chart. But although it is excellent for some purposes, the pictograph form of chart design is not recommended for standard use, especially in report presentation.

This type of chart costs much more (in both time and money), is much harder to do well, and most important, is very limited in the kinds of comparison it can present. Pictograph charts almost always turn out to be bar charts, and there are many kinds of statistical comparison that cannot be shown satisfactorily in that form.

Sometimes "graphic labels" - pictorial symbols that portray the subject graphically - can be added to conventional charts with good effect. This is a good compromise if you must have pictures, but even this method is not recommended for standard use. As a general rule, pictorial treatments should be used only for "popularizing" - for interesting readers who have little or no interest in the subject or knowledge of the data. Most statistical charts are made for people who either want to read them or have to read them, and who do not need pictures to draw their attention to the chart or to explain its subject matter.

Maps

Map presentation is sometimes an excellent way to show statistical data. However, as a general rule maps should be used only when geographic distribution is of primary importance.

There is a difference between geographic distribution and mere geographic location: a distribution not only shows how much is where, but also brings out geographic relationships that would not be clear unless they were presented on a map.

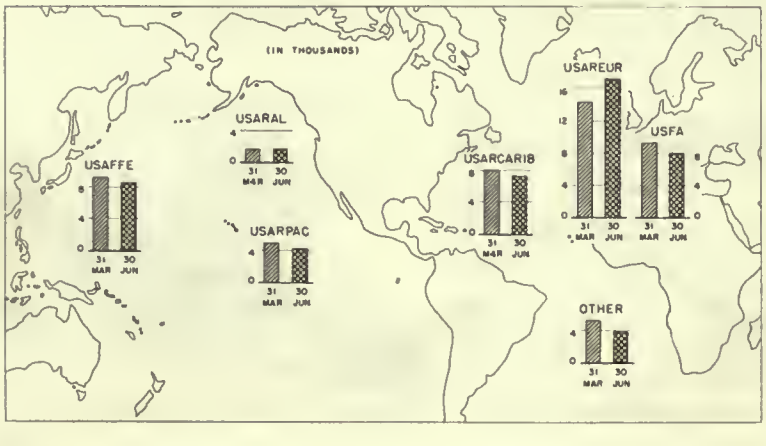
Many comparisons of data for different places can be presented better if not shown on a map. In map presentation, the graphic devices (bars, columns, spots, pictographs) get only a small fraction of the space used, thus producing a picture that is a very large part map and only a small part data. Usually this same information can be shown to better advantage if presented in conventional chart form: the graphic parts can then be brought together for closer comparison, and the empty space that would be lost in a map can be put to other use (see the example below).

Of course mere geographic location is sometimes of enough importance to call for a map; but generally readers do not need to be shown where Chicago or Texas or FECOM is in order to compare data for these places with similar data from other places. In many cases the reader will get more out of the story if the effort required to prepare a map is put instead into finding the most effective way to chart the data.

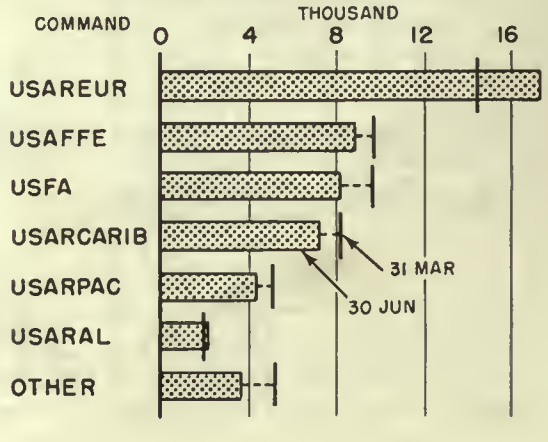
Caution: If you use maps in reports, especially maps of the entire world, try to avoid difficult reproduction and binding problems by doing this:

1. Avoid map originals that are large or that have a great deal of detail that is not needed.
2. Do not use a map that is larger than needed; do not show the whole world if the analysis concerns only part of it.
3. Always try to avoid long horizontal maps that must either be reduced excessively to fit the page or be printed as oversized fold-in pages.

ARMY CIVILIAN PERSONNEL OVERSEAS
PAID FROM APPROPRIATED FUNDS



ARMY CIVILIAN PERSONNEL OVERSEAS
PAID FROM APPROPRIATED FUNDS



TYPICAL EXAMPLES OF POOR PRESENTATION

There are many ways to present statistical data poorly. Most of these - fortunately - are seldom seen; but there are a few kinds of faulty presentation that appear so often that they require a special word of warning. These are:

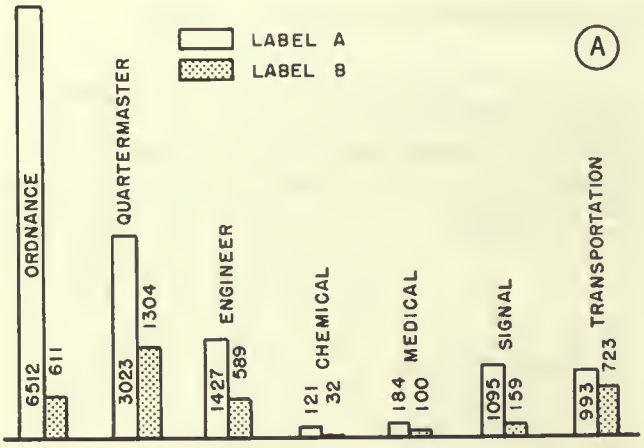
1. Using vertical instead of horizontal bar charts.
2. Putting too many figures on the chart.
3. Putting figures inside the bars or columns.
4. Breaking the zero end of column (or bar) charts.
5. Using double amount scales that serve no useful purpose.

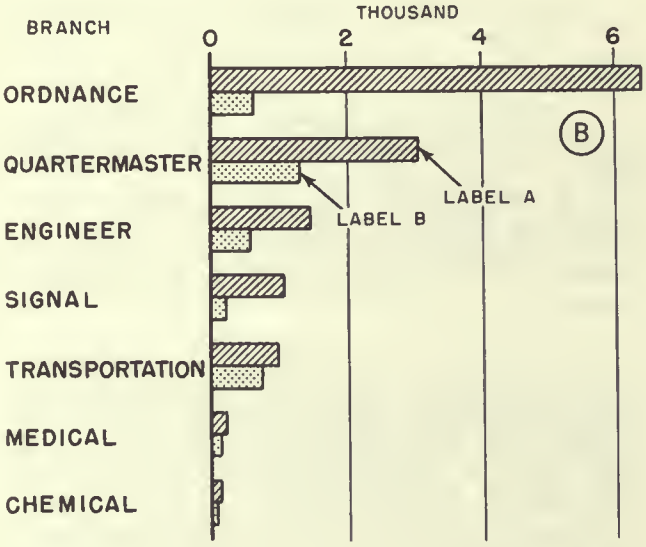
Chart A is a good example of how not to design a bar chart. Comparative bars should be drawn horizontally; first, because vertical bars look like a column chart (an entirely different kind of chart) but even more important, because horizontal bars are so much easier to label, especially if the captions are long. Chart A also has the added fault of too many figures cluttering up the chart. Chart B shows how much better the standard arrangement works out.

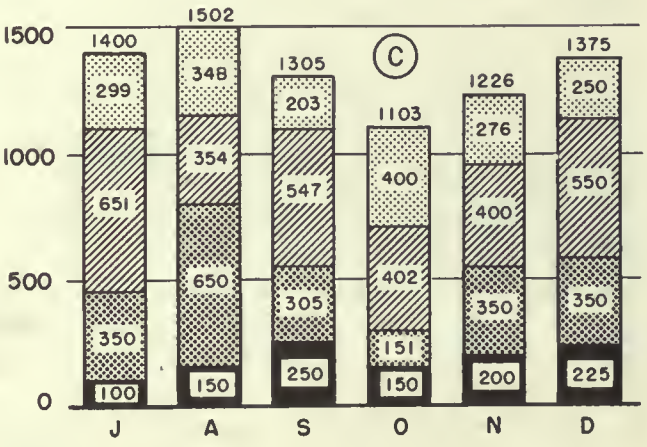
Chart C illustrates how fault number 3 can weaken an otherwise effective chart. This is fault number 2 carried one step further. It shows what happens when an attempt is made to combine a chart and a table. The result is not satisfactory as a table or a chart. If figures must be used on a chart, keep them outside the parts to which they relate (see page 71).

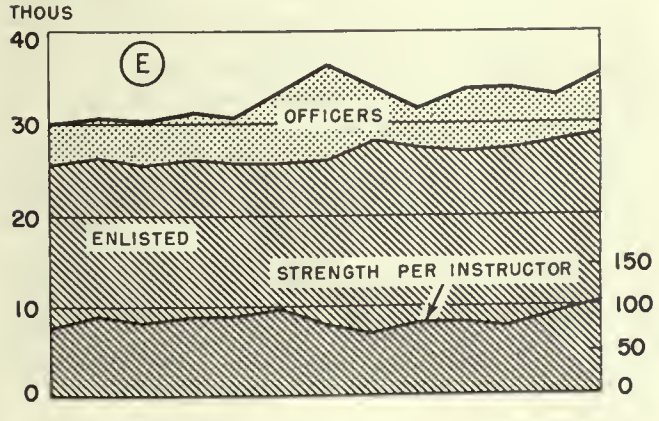
Chart D shows another everyday error. Columns (and bars) are linear measures: their total length measures the amount of something; and they should not be broken (see page 89 for exceptions). Cutting off the lower part of this kind of comparison is like measuring people's height from the shoulders up. If this chart is meant to show not totals but differences in totals, it should be a curve chart (see page 80).

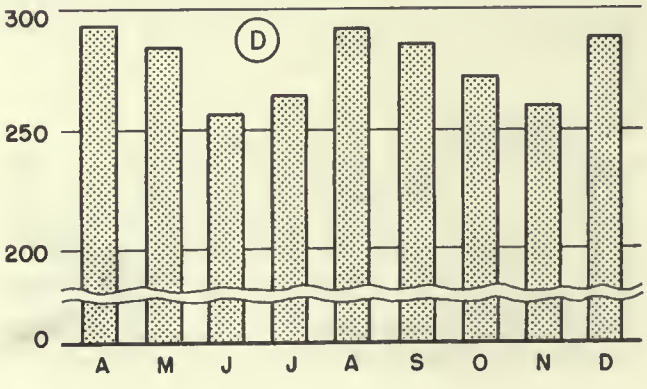
Chart E is a typical example of trying to make one chart do the work of two. Sometimes this is a good idea; but in this case it is not. In the first place, the chart is confusing: the lower curve seems to divide "enlisted" into two layers. It is not clear at a glance what labels what. The level of the "per instructor" curve moreover is meaningless: it could just as logically be higher or lower. This curve should be shown in a separate chart.











PLANNING AND DESIGNING CHARTS

The graphic part of this manual began with general suggestions on when to use charts and then followed with a catalog of chart types. This next section goes a setp further: it explains how to develop charts from tabular data, how to get the most out of various types of charts, and how to avoid some of the common faults of chart presentation. It also tells how sketches can be useful and reviews the question of what styles are best for statistical charts. All of these are things the analyst should know when designing charts.

The most important principle to follow in chart design is to keep them simple.

Charts should be simple in content as well as in design. They should be limited to one central idea. This can be done by:

1. Breaking up complex information into a series of simple ideas and using a chart for each one.
2. Showing the key ideas in chart form;the supporting details in tables.
3. Presenting multiple series as a group of individual charts instead of as a disorganized tangle.

A further way to keep charts simple is to show relationships instead of comparisons. Ratios, percentages, or other relative measures are simpler and more direct than the double data they compare. Such relationships should be significant and not misleading.

Keeping charts simple in design means pruning out trimmings and squeezing out padding. Do this by:

1. Omitting any scale designations, captions, rulings, arrows, or other parts that are not needed.
2. Condensing, by rounding numbers, abbreviating capations, or shortening the time-scale designations.
3. Editing titles, captions, and labels to make them concise.

Suggestions 1 and 2 are demonstrated later in the "Chart Construction" section (see pages 82-84, 86, 87, 99 and 101). Suggestion 3 is illustrated on pages 82 and 99.

Charts that are not accompanied by text or supporting tabular data may require additional detail to make them complete. These supplementary details, however, should be kept as simple as possible.

Planning Charts

A well planned graphic presentation should highlight the important statistical facts. The reason for using charts is to provide pictures that quickly show the reader the salient quantitative relationships. A report that contains nothing but charts usually is inadequate, unless they are designed for use by technicians and top executives, who are thoroughly familiar with the characteristics of the data.

CHECK LIST FOR DESIGNING CHARTS

1. Use charts for salient facts only.
2. Limit each chart to one major idea.
3. Adapt the chart type to fit the needs of the data.
4. Keep the design simple and uncluttered.
5. Separate unrelated charts; group related ones.

Text and tables generally are needed to answer questions as well as to fill in the background, explain what the charts mean, and provide supporting detail.

Too many charts may tire the reader. Charts are emphatic, but too many of them prove the point that when you emphasize everything, you emphasize nothing.

Charts should be used only when they add something important to the report: do not use them when the story can be told better in text or in tabular form. In fact, every chart should pass a rigid "Does it really show something?" test before being used. Merely translating data into graphic form does not automatically produce a useful chart.

Another strong reason for not using charts too freely is that if they are used for things that are not really important, they steal the reader's attention from other things that are important. This is especially true when only a few charts are used. The fewer the charts, the more emphasis each one gets and if only one or two are used they should emphasize the most important facts.

Presenting Charts to the Reader

Charts about different subjects should be separated by text or tabular material. When several charts follow one another without an intervening "rest," the reader is confronted with too much to look at - especially if all are on the same page. Each succeeding chart distracts the eye from a careful study of the one ahead of it. This is especially true if the succeeding chart is stronger or bolder.

If two or more charts are directly related and the reader is to compare them, then they should be placed close enough for easy comparison. It is usually a good idea to separate them with a few lines of text, unless they are extremely simple. This scheme not only helps to focus the reader's attention on one thing at a time, but also helps to keep the page from looking crowded. These suggestions, however, do not apply to a group of small charts all on the same subject.

If the chart and its text will not fit on the same page, save the chart for the next page: it is better to tell the reader about what he will see on the next page than to tell him what he has already seen on the page before.

DEVELOPMENT OF CHARTS FROM TABULAR DATA

A well-thought-out table sometimes holds so much information, or is about a subject so important, that several useful charts could be made from it. Usually, however, only one or two meaningful charts can be expected from any one table. The problem is not "how many charts can be made from these data?" but "can an important chart be made from these data; and if so, what is the best type to use?"

Deciding Whether to Chart

The choices of what to chart or whether to chart at all cannot be made by rule but only after a careful study of the data. The decision as to whether to chart is affected by the answers to four questions:

1. Is the subject important enough (in relation to other material in the report) to put into chart form?
2. Is the information timely enough to be worth a chart?
3. Are the figures meaningful enough to warrant a chart?
4. Will a chart tell the story better than text or tabular presentation?

If the answers to any of these is "no," think twice before using a chart. Nothing weakens a report as much as charts that are not needed. Charts that do not support the principal purpose of the report steal the reader's attention from the more important relationships.

Deciding What to Chart

A chart presents a limited number of figures in a bold and forceful manner. To do this a large number of figures available on the subject usually must be omitted. The choice of what to chart is largely a matter of deciding what figures have greatest significance to the intended reader - and what figures he can best afford to skip.

If it is known that key readers are particularly interested in a specific problem or question, this should be kept in mind when selecting material. Study the data to see if any other significant relationships or tendencies should be emphasized. Consider how the figures shown in the chart might be used as a basis for decisions and actions.

Some of the comparisons that can help to bring out key facts are listed below:

Results with earlier results;
Results with programs, goals, or standards;
Results with results of others carrying on the same activity;
Income and outgo - gains and losses;
Contributing factors of a condition or result;
Component parts of a total;
A total and one or more of its parts.

In addition, many of these comparisons can be represented as relationships (as ratios, percentages, or other relative measurements). For example, actual strength as a percent of authorized is sometimes more meaningful than a direct comparison of actual and authorized strengths.

Deciding How to Chart

After deciding which data are the most important to chart, the specific type of chart to use must be determined (see "Chart Types," pages 46-61). Even when one type seems best at first, it is generally desirable to sketch several alternative charts before deciding which one shows the pertinent relationships most clearly (see "Chart Sketches," page 70).

Example of Chart Development

The charts on the next two pages were developed from the table below which shows actual figures used in Army administration. Although these charts were designed some time ago they are shown here as a good example of how the facts in a simple summary table can be presented in several different ways. They are not intended to suggest that the statistician should try to get several charts from each table.

Notice that no two of the charts are exactly the same. Each one is different because its purpose is different: each focuses attention on a different aspect of the data or puts a different emphasis on a given aspect. This is one of the more important points to remember when designing charts. A change in the chart changes the story. The choice of what type of chart to use is not a matter of taste; it is always a matter of judgment.

GENERAL PURPOSE VEHICLES DISABLED FOUR DAYS OR MORE

Service	May		June		July		August		September		October	
	Total	Due to Lack of Parts	Total	Due to Lack of Parts	Total	Due to Lack of Parts	Total	Due to Lack of Parts	Total	Due to Lack of Parts	Total	Due to Lack of Parts
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ALL SERVICES	922	625	1,271	774	856	533	981	675	1,247	679	1,486	682
Chemical . . .	98	48	78	43	78	23	39	17	91	51	95	51
Engineers . .	136	116	136	97	29	29	19	18	29	29	21	17
Medical . . .	41	25	81	44	4	2	6	5	5	2	9	6
Ordnance . . .	252	174	368	221	265	193	353	268	606	218	654	164
Quartermaster	116	63	76	41	61	21	61	23	59	31	58	28
Signal	69	44	80	34	28	15	31	23	39	34	46	30
Transportation	210	155	452	294	391	250	472	321	418	314	603	386

The illustrations on this page show how the data may be presented to emphasize changes that have occurred from one period to the next during the entire time span covered by the table. They show not only how things stand at present but how they stood at earlier periods, and - to some extent - provide a basis for estimating where they may be heading. All four charts shown are time series charts selected from the types discussed on pages 46 through 53. These charts show only ALL SERVICES totals, and do not provide service by service comparisons. However, the same kinds of chart could be presented for each service.

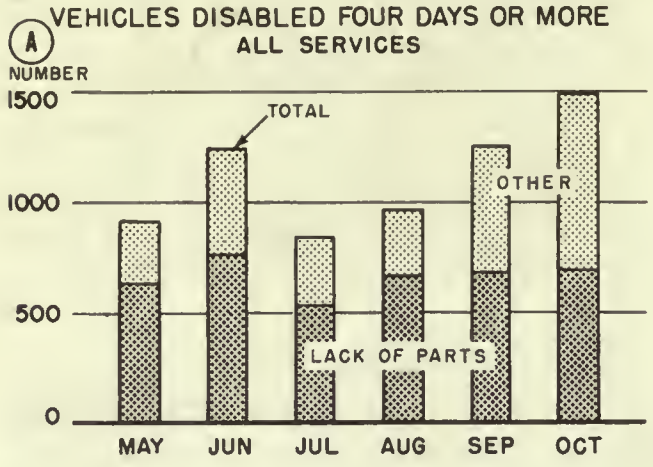


Chart A puts main emphasis on TOTAL NUMBER of vehicles on which repair was delayed four days or more. It shows also the COMPOSITION of the total by cause.

This chart stresses the changes in the total from period to period and also the changes in the component next to the base line. Changes in the other component are not as easily read, and direct comparisons between the two components are not provided. This type of presentation paints the picture in bold broad strokes.

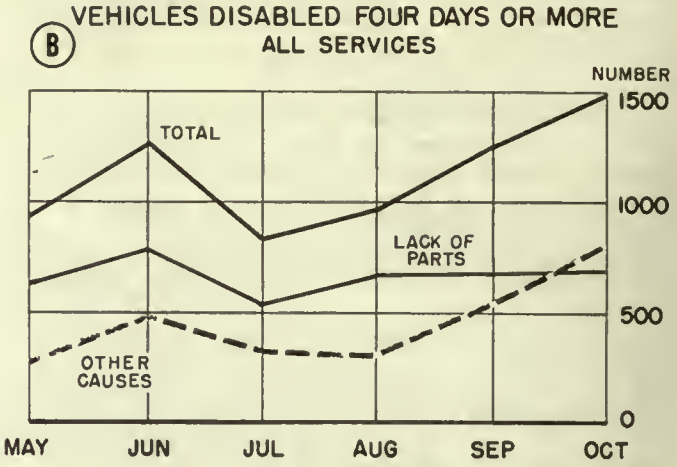


Chart B shows the same information as Chart A, but is designed to compare the components directly. It also provides a comparison of each component and the total. The composition of the total is not quickly apparent, but is easy to see if you look for it. It can be read with either component at the base.

This type of presentation, although not as arresting as Chart A, provides a better picture of the interrelationships of the data, since it permits precise measurement of both components.

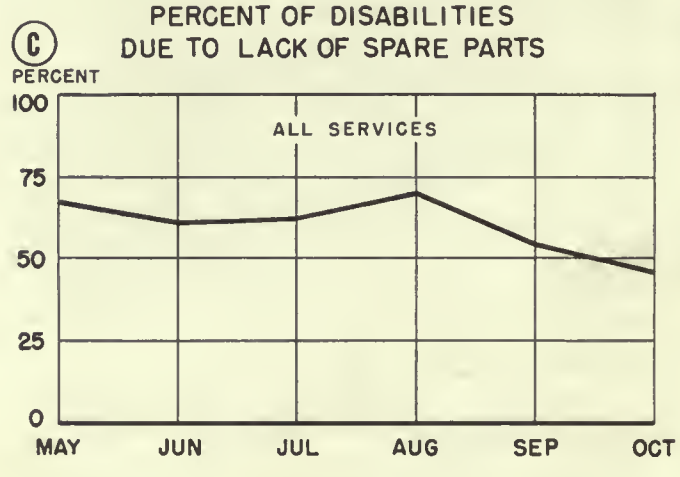


Chart C shows the RELATIVE importance of lack of spare parts as a cause of delay. (Columns 3, 5, 7, 9, 11, and 13 as percent of Columns 2, 4, 6, 8, 10, and 12, respectively, of the table on page 67.) This picture is not quickly apparent in Chart A; but it is somewhat more so in Chart B.

This type of chart provides a picture of changes in a significant ratio, without regard to the absolute values behind the ratio. Extreme variation in the absolute amounts, especially if some are very small, weakens the value of this type of chart.

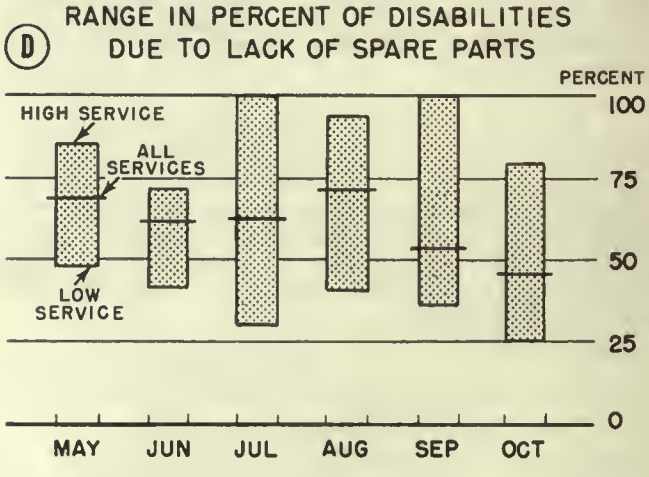


Chart D shows the same data as Chart C, plus the RANGE between the high and low service each month. This presentation amplifies the picture shown in Chart C, bringing out the spread among the figures from which the "All Services" values are derived.

Note that the spread between high and low increases, even though the "All Services" trend is generally downward. Note also the difference in range for June and July when the "All Services" figure showed almost no change.

The four charts on this page emphasize relationships between components of the total for a specified period. Two of the charts examine the causes of disability; two focus on the proportion of vehicles disabled due to lack of spare parts. The first two present a cross-section of the total at a specified period of time. The third provides a secondary comparison that measures one period against another. The fourth summarizes results during the entire time span ocvered. Note that all of these charts are bar charts selected from types discussed on pages 54-57.

NUMBER OF VEHICLES DISABLED
FOUR DAYS OR MORE - OCTOBER 19X1

(E)

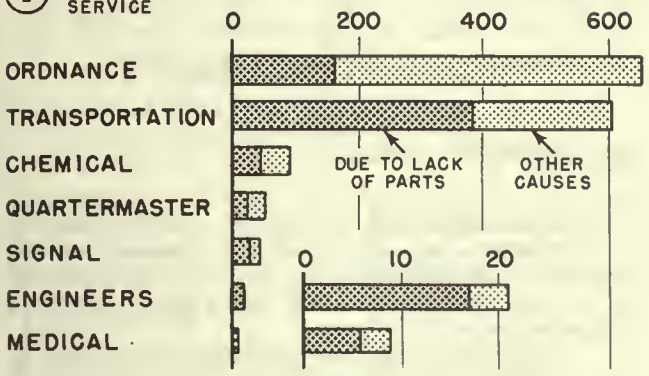


Chart E shows for each technical service the TOTAL NUMBER of vehicles disabled four days or more, and also shows how many were delayed in repair by lack of spare parts and by other causes.

The main comparison here is between TOTALS; if a comparison of only the number of disabilities due to lack of parts is wanted, only that portion of the bars should be shown (see Chart G below). However, putting the "lack of parts" segments next to the base line permits this secondary comparison. (See page 72 for comments about the type of insert chart used in Chart E).

PERCENT DISTRIBUTION OF VEHICLES DISABLED
FOUR DAYS OR MORE - OCTOBER 19X1

(F)

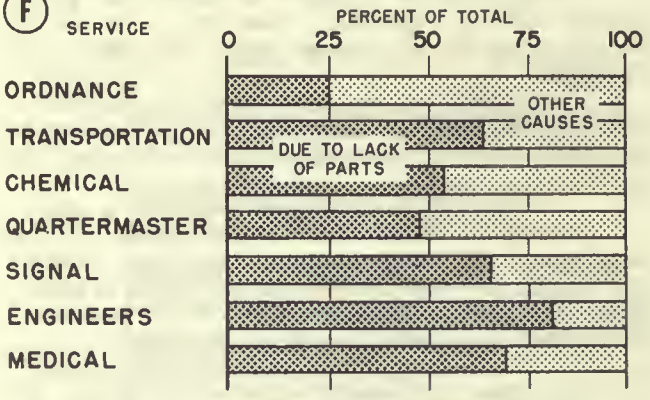


Chart F shows the PROPORTIONATE PART of delays in repair which resulted from lack of spare parts and from other causes. Since this type of presentation measures the relative importance of each component, it often reveals facts not readily apparent in a chart showing absolute values.

However, a percentage distribution such as this may have little meaning if there is a wide range in the size of the absolute values. The significance of percentage relationships may be clarified by showing the absolute data as a column of figures in the stub (see page 71, "Designing Bar Charts"), or in a separate chart or table.

PERCENT OF VEHICLES DISABLED FOUR DAYS
OR MORE DUE TO LACK OF PARTS
SEPTEMBER AND OCTOBER

(G)

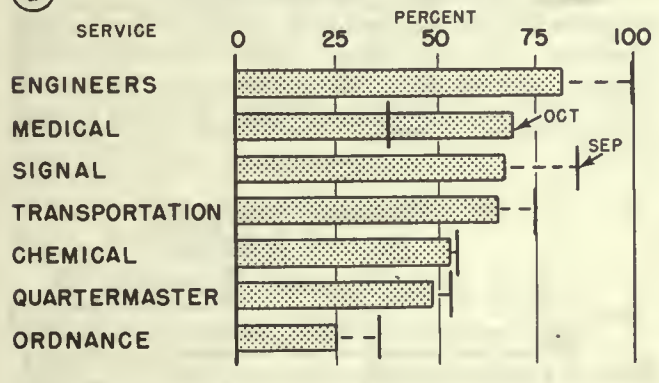


Chart G emphasizes the comparison of the "lack of parts" percentages shown at the left of Chart F. Although the "other causes" segment is not shown in this chart, it can readily be seen as the difference between the bars and the 100 percent line.

As an added feature, this chart also shows the same measurement for an earlier period. Thus it permits a three way comparison: of current results, of earlier results, and (indirectly) of the change from one time to the other.

PERCENT OF VEHICLES DISABLED FOUR DAYS
OR MORE DUE TO LACK OF PARTS
RANGE FOR PERIOD MAY - OCT 19X1

(H)

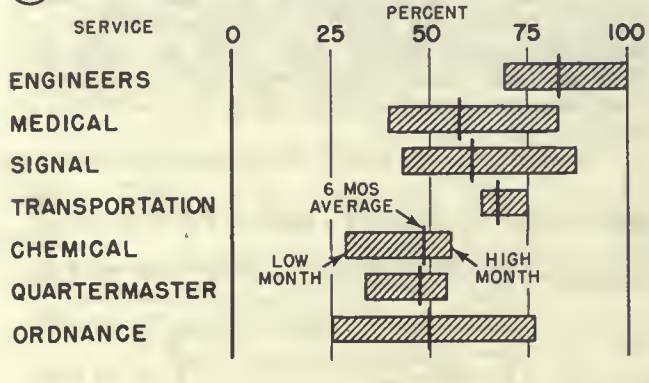


Chart H carries the story presented in Chart G a step further. It shows an over-all picture for the entire period covered, instead of just the current period. Emphasis is on the range in the "lack of parts" percentage during the period, without identifying specific months.

The averages show the general level for the entire period and indicate indirectly how the monthly values are distributed within the range. Note that Transportation, with a slightly higher average than Signal, has a much narrower range.

214-853 O - 66 - 5

CHART SKETCHES

Sketches are a vital part of chart preparation. They are valuable not only for trying out different types of chart but also for three other important uses:

1. Testing the data: to see if they show the sort of relationships expected as well as to see if certain relationships will need special explanation.*
2. Testing the design: to work out problems of scaling, spacing, labeling, and other "bugs" that do not appear until the sketch is started.
3. Instructing the draftsman: to provide a model of the kind of chart wanted, plus any special instructions or specifications needed in drawing the chart.

Without a sketch (or earlier chart of the same data) all of these things have to be done the hard way, and often with the usual by-products of all trial-and-error methods: mistakes, revisions, unsatisfactory final results.

Sketches are useful also for getting approvals and clearances that are needed in advance of publication. Sometimes they can even be used to do the work of finished, inked charts. Illustration B on this page shows how satisfactory a careful sketch can be. Drawn with a medium soft pencil (2-H), with lettering typed or penciled in (free hand), a good pencil sketch can be done in less than half the time it takes to do the same chart in ink. Even longhand lettering is satisfactory if done neatly.

For many informal presentations, and especially for hurry-up, 2 or 3 - copy jobs, sketch-charts have many advantages. Excellent copies can be made (by offset or other photographic processes) if the originals are drawn with the understanding that they are to be reproduced.

Caution: Do not draw sketches on ordinary commercial graph paper if they are to be reproduced. Most graph papers are printed with green ink which generally reproduces black. This results in a coarse screen of background lines that make the chart hard to read. If the lines are printed with a light non-photographic blue ink (a few commercial papers come this way) they will disappear in reproduction processes.

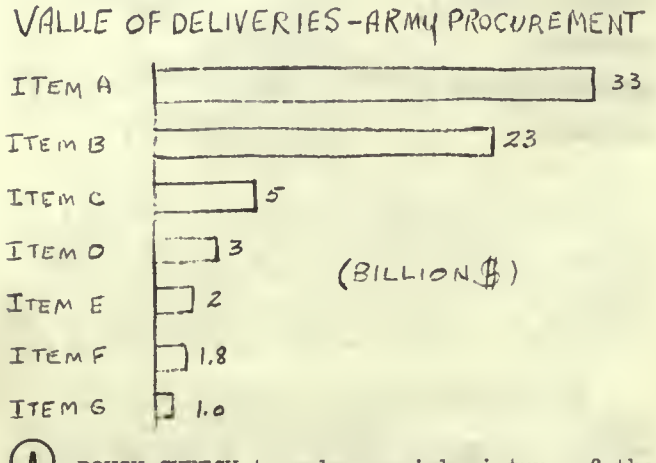
* It is important to remember that charts serve a double purpose: they are useful not only for demonstrating facts to the reader, but also for revealing facts to the writer. Often, an analysis written before the data have been charted will have to be rewritten because the chart shows a different picture than expected or reveals additional facts which were not apparent. This is one good reason why charts should be roughed out in sketch form early in the development of the report.

DATA SHEETS FOR CHARTS

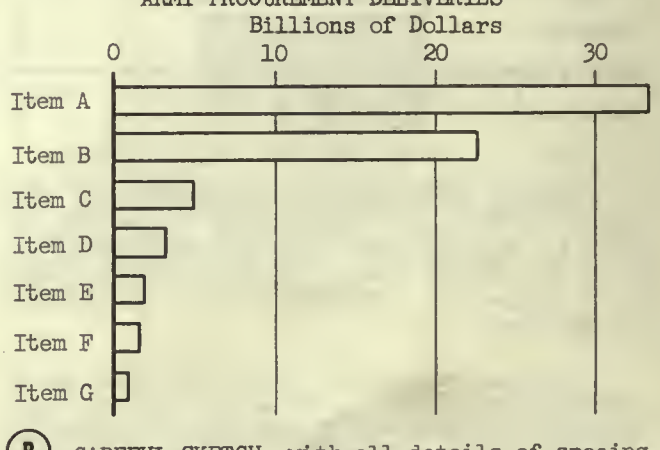
It is important to furnish chart data to the draftsman in a way that he will not misinterpret it. Prepare special data sheets designed for plotting purposes. On these data sheets it is desirable to:

1. Include only the plotting data, or at least clearly mark which columns or rows are to be plotted.
2. Identify the data with the same captions that will be used on the chart. If this is not feasible, mark the columns of data A, B, C, etc. and then mark the chart sketch to correspond.
3. List the data in the same order they will take on the chart. For example, data for three curves - total, group B, and group A - should be listed on the data sheet in that order.
4. Cumulate data for subdivided charts. Instead of showing the amounts for components A, B, and C, show the figures for A, then for the total of A plus B, then for the total of all three.
5. Round figures for ease in plotting. A three-digit figure is about as close as you can plot on a small chart; a four-digit figure, on a large chart.

Sometimes the need for speed prevents the preparation of proper data sheets, but poorly prepared plotting data sheets increase the length of time required to prepare the charts and they are likely to result in errors that also add to the delay.



(A) ROUGH SKETCH to make a quick picture of the data and present a general idea of how the chart will look.

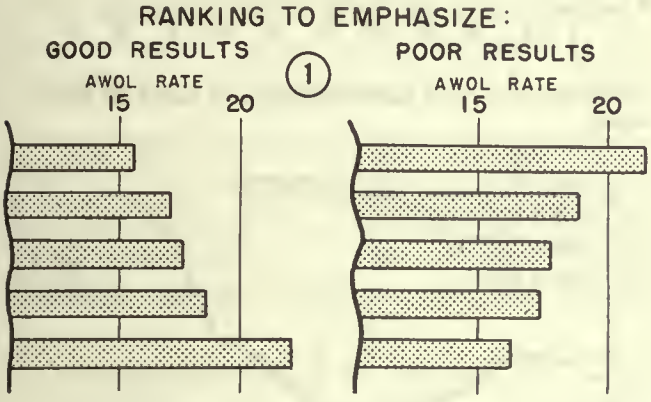


(B) CAREFUL SKETCH with all details of spacing and captioning worked out. Used for approvals or even as the final chart.

DESIGNING BAR CHARTS

Bar comparisons have several special advantages that should not be neglected.

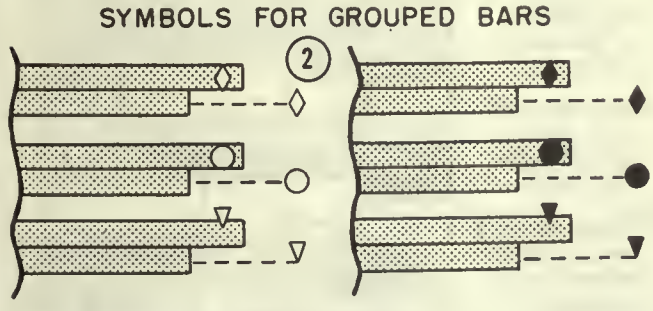
RANKING. The items in a bar chart can be listed in various ways. (See pages 22-24 of the Tabular Presentation chapter.) Probably the most useful is in order of the magnitude of the data. The standard arrangement is from best to worst. Exception: When the aim is to emphasize unfavorable conditions, items are ranked from worst to best.



When grouped bars are used, ranking is based on the most important set of bars. When one set represents current data, one earlier data, the current bars are normally shown first and shaded the strongest. In bar-and-symbol charts, ranking is normally based on the data for the bars. (See Chart 3.)

GRAPHIC SYMBOLS. Adding supplementary data by means of graphic symbols is especially useful in bar comparisons. These symbols are effective for spotting key values such as schedules, programs, or other standards or goals. Symbols are useful also for showing data for some earlier period - say, last month or last year. Used in this way, a bar-and-symbol chart can summarize several time series by showing what changes have taken place from past to present.

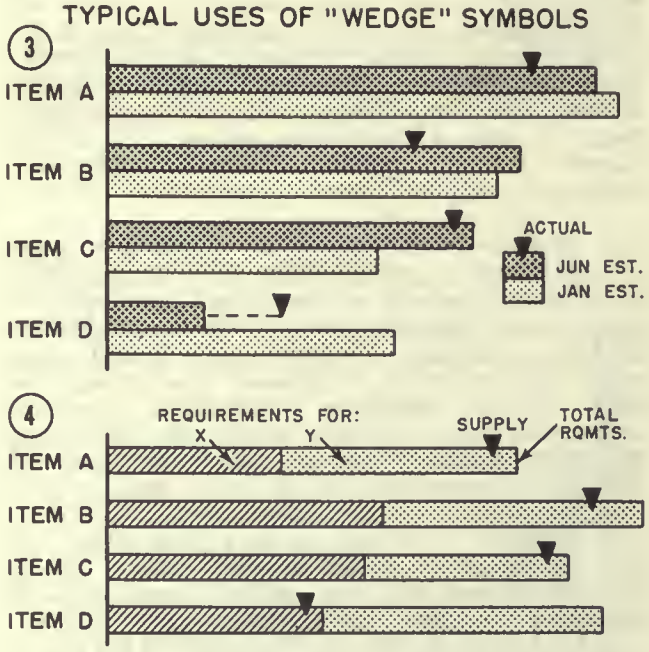
The standard symbol (a heavy "slash-line" that crosses the bar and extends on either side) does not work well for connected bars. Instead, use diamonds or circles. Diamonds locate the plotted points more clearly than circles; circles are easier to draw.



Caution: Filled-in diamonds or circles are so black that they dominate the chart. This may be desirable when the symbols represent goals or standards and so should be prominent; it is undesirable when they represent an earlier date.

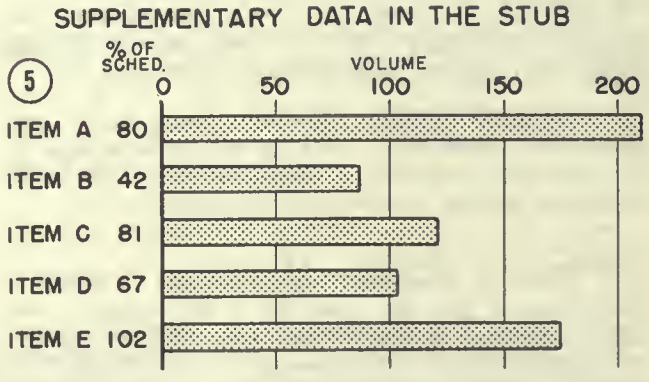
A third type of symbol - a wedge, or half diamond - is useful for special cases. Its main use is as a bench mark. This symbol is most effective when it cuts into the bar; least effective when it floats beyond it.

Chart 3 shows one way to use this device; Chart 4 another. Still another use: to measure progress to date, against subdivided bars showing progressive steps of construction, production, or readiness.



STUB DATA. Sometimes there is an advantage in adding supplementary or supporting data in the stub of a bar chart. These figures usually are a different kind of measurement than shown by the bars (for example, dollars vs. percent, tonnage vs. days of supply, workload vs. completed).

Adding these supplementary data increases the value of the chart considerably, because it helps to round-out the picture and make the bar comparison more meaningful.



NOTE: Using the stub to show the plotting data for the chart is not recommended as standard practices. If the figures must be shown on the chart, however, the stub is usually a better place to put them than inside or at the ends of the bars.

INSERT CHARTS

Inserts for Added Information

Sometimes a chart can be made more useful by adding a small insert chart that shows a different view of the data.

Time series charts are particularly good candidates for this treatment. For example, a chart showing the trend of civilian personnel might have an insert comparing the components of this total at two key dates. Or, the insert might show the percentage composition of the total at several key dates; or the ratio of the total to some larger total such as total military and civilian strength; or the difference between civilian strength and a quota or ceiling. In fact, almost any series of data will suggest several related trends or comparisons that would help to round out the story.

Of course many charts do not provide space for an insert: unless there is a strong trend, up or down, there is seldom enough open area for even a large postage stamp. This is particularly true of charts that are only a half page wide. If the insert is planned in advance, however, it can sometimes be fitted in by merely making the grid a little taller, or increasing the scale range. Charts 1 and 2 show that an insert will sometimes fit in even a small chart.

CAUTION - Do not overdo a good thing: do not try to put an insert in every chart; and be sure the insert will add enough to the value of the chart to "carry its weight."

"Blowup" Insert Charts

In many bar comparisons, the difference between the longest and shortest bar is so great that some of the shorter ones can barely be seen. If the bars are subdivided, the problem is just that much worse.

One way to get a close look at the very small items is to add an insert chart that shows them on an expanded scale (five or ten times as large as the original scale). This method will almost always work when the bars are ranked.

The insert bars should be the same thickness as the others; but if there is not enough room, they can be made slightly narrower.

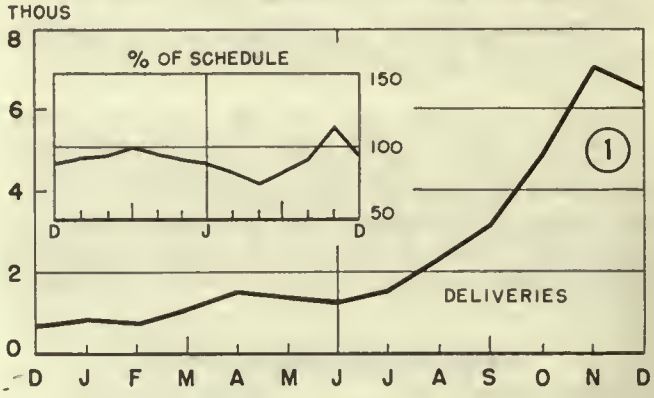
The stub captions usually will serve for the blowup bars also; but if the bars cannot be put directly opposite, these captions should be repeated in the insert (abbreviated).

"Total" Insert Charts

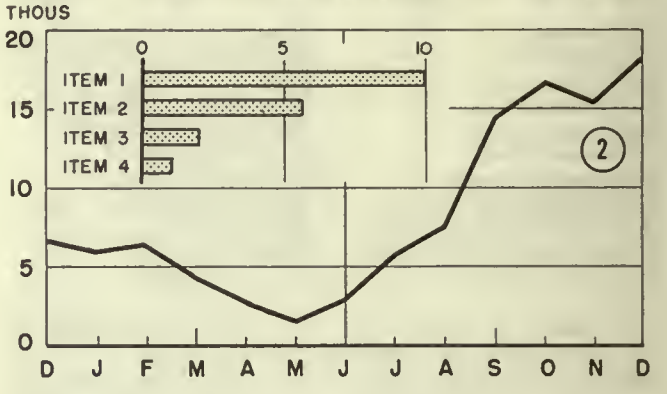
There is sometimes an advantage in showing the total of all the items in a bar chart. Unless one bar is extremely long and the others extremely short, the total cannot be included as part of the main comparison; but it can often be included as an insert. As shown in Chart 4, this sort of insert is just the reverse of a "blowup": it is a reduced scale insert.

Do not show this sort of insert vertically; in a horizontal bar chart it is an item comparison and therefore should be horizontal.

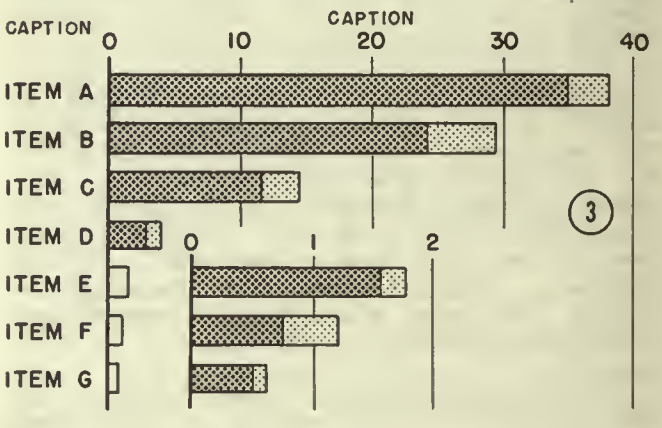
INSERT TO ROUND OUT THE STORY



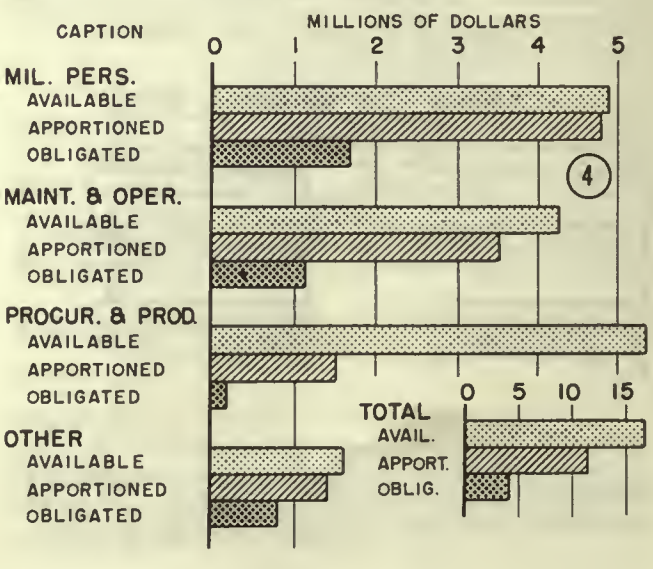
INSERT TO SHOW COMPONENTS AT LATEST DATE



"BLOWUP" INSERT



"TOTAL" INSERT



SUBDIVIDED SURFACE CHARTS

This type of chart is used many times when it should not be. It is excellent for showing how the component parts of a total change in importance over a span of time, but it shows only a "broad brush" picture. Unless the changes are pronounced, this form of presentation hides them instead of revealing them.

Also, it is not an easy chart to read. Only the total and the bottom layer can be read directly from the amount scale: the other components must be read indirectly, by subtracting the amount of one curve from another to find the difference. Sometimes exact measurement is not important; but when it is, this is not the best type of chart to use. (See Chart B, page 68).

Besides being hard to read, subdivided surface charts can sometimes show a misleading picture. This is most likely to happen when the data take a sudden change in direction, or when one of the components is very irregular (large one month, small the next, then large again, then small, etc.)

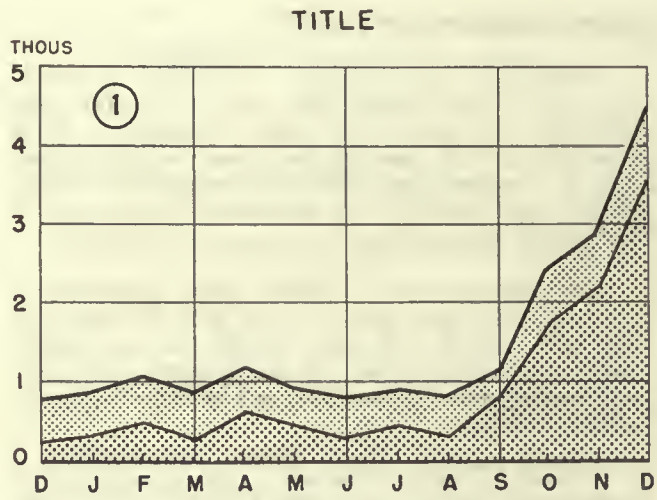
Sharp Trends

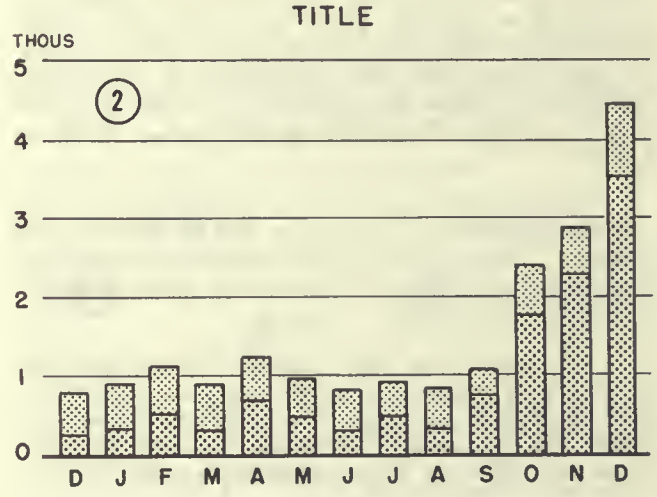
If you show the components of a sharply rising series, watch out for a bad optical illusion. In Chart 1, the top layer seems to be getting smaller toward the end of the year: as you can clearly see in Chart 2, this component actually is larger in the last three months of the year than in any other. The trouble in Chart 1 is that the eye finds it easiest to measure across this layer at right angles to the direction of the slope instead of vertically. Even when you know that such a chart is misleading it is difficult to make your eye see it correctly.

A recommended solution is to change to a curve type of chart, or to a column chart, if appropriate, as in Chart 2. Of course when you change to either of these types, the top component becomes a series of disconnected segments instead of a continuous layer; but this is a smaller fault than the distortion that the layer treatment produces.

"Irregular" Components

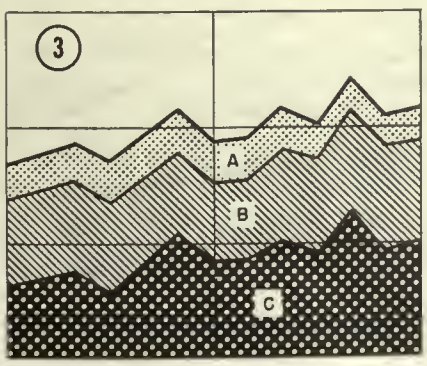
There is another illusion that occurs in surface charts, and this one also is caused by the way the data behave. If the values in one

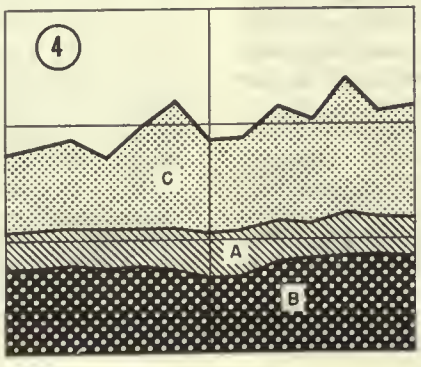


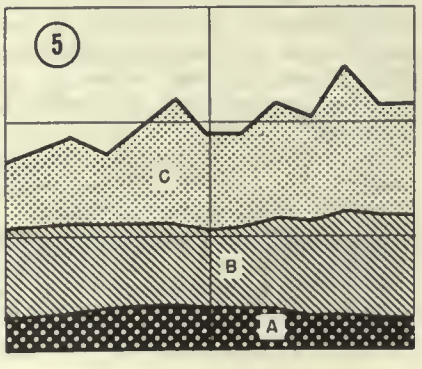


of the components fluctuate sharply - in other words, if one of the layers is very uneven - it makes any layer put on top of it seem uneven too. In Chart 3, layer C makes A and B follow such an irregular path that they seem much more uneven than they are. Chart 4 shows a better arrangement of these components, Chart 5 a still better one.

Of course, it is not always possible to shift the order of the components to fit the behavior of the data; sometimes one order is either so fixed or so logical that any other seems wrong. But when one component is extremely erratic, try to find a logical arrangement that will put this layer at or near the top of the chart.







STATUS-CHANGE-STATUS CHARTS

There is often a need to show both inventory data and production data for the same subject. By presenting these together, it is possible to show how things stood at the beginning of each period, what activity took place during each period, and the resulting status at the end of the period.

A combination of this kind provides a rounded story that can be much more informative than either series alone. But if you attempt to combine the two kinds of measurement into one continuous time series, you may get some strange looking charts.

Chart 1A shows the most acceptable way to interweave status and change data. This form follows the same general method used in constructing a progressive bar chart (see page 57). It presents a fairly clear picture if the reader understands that each column represents the end of one month and the beginning of the next. Chart 1B is less satisfactory because it looks like a series of divided double bars, which it is not.

Chart 2A is generally a better way to show the ins and outs and their net effect on the status. By separating the production data from the inventory data, it presents a clear easy-to-understand picture.

If there is a large volume of ins and outs but a small volume on hand, as there might be at a Reception Station, the inventory curve will cross the columns, producing a simple combination type such as the one shown on page 59.

If there is a large volume on hand but a very small volume of ins and outs, the two series may be too far apart for easy comparison. One way to remedy this: put the ins and outs on a separate grid directly above the curve chart.

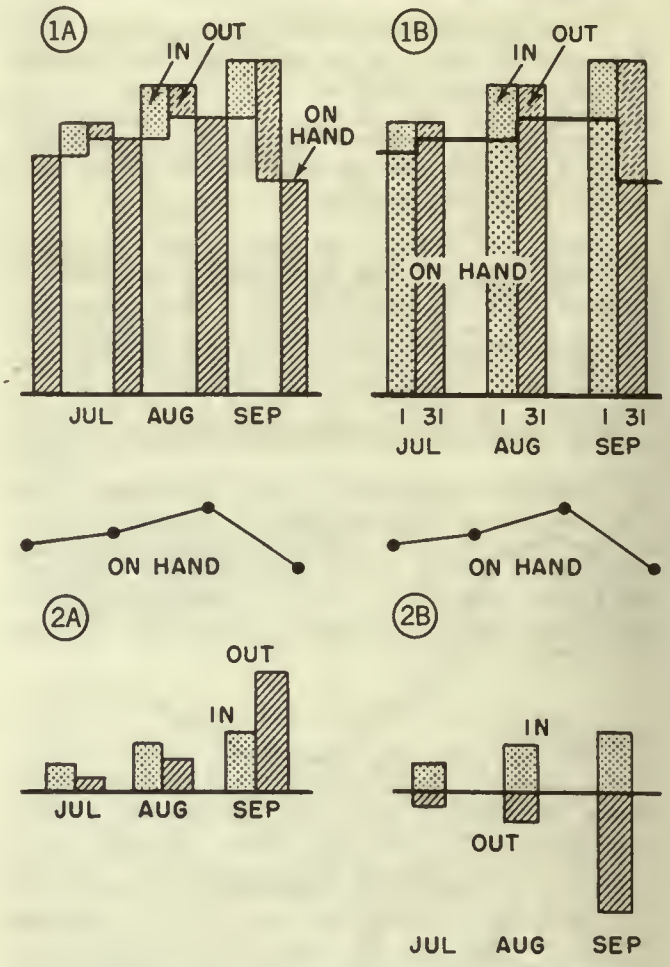
Chart 2B shows a method to use if the ins and outs combine to make an important total, such as additions to and shipments from storage (total work volume). Although this method uses more space, it has a compensating advantage: the outs extend downward and so appear to pull down the on hand curve when they exceed the ins.

CHANGES IN THE CONTENT OF THE DATA

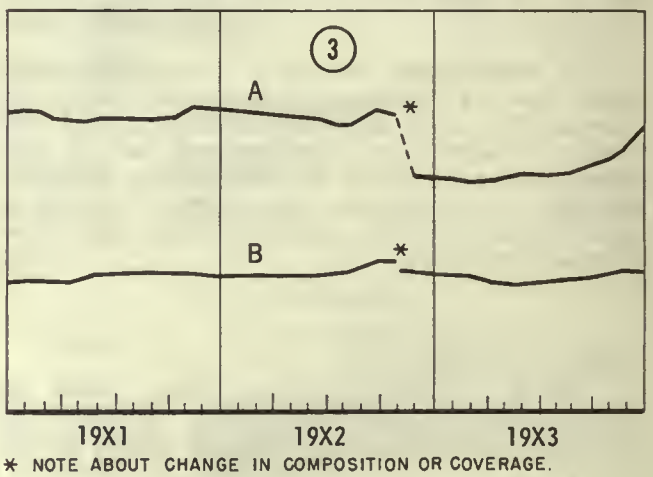
Sometimes the composition or coverage of the data changes suddenly (or the effect of a gradual change is finally adjusted for). A typical example of this would be a change in the definition of the geographic area under the control of an oversea command, or a change in the meaning of the term "deliveries."

When these changes are important enough to change the level of the data, they should be clearly indicated to prevent the reader from misreading the chart. For example, without some warning signal, a sharp drop in a production curve will be misinterpreted to mean a decrease in production instead of merely a change in definition that excludes items formerly included.

COMBINING STATUS AND CHANGE DATA



HOW TO SHOW A CHANGE IN THE DATA



* NOTE ABOUT CHANGE IN COMPOSITION OR COVERAGE.

Curve A on Chart 3 shows the standard method of showing a basic data change: a light dash line connecting the old and new series. Unless stated in the labels, the change should be marked with an asterisk and explained in a footnote. Curve B shows the method to use if the change in level is very small. If the data are available, there is an advantage in including in the footnote the value for both the old and new series at the point of the change-over. This makes it clear that the break is not an omission of data.

LOGARITHMIC CHARTS

Charts having logarithmic amount scales are useful for comparing ratios instead of amounts. This type of chart, sometimes called a ratio chart, is widely misunderstood and misused. It should not be used unless the writer and the typical reader understand its characteristics.

On an arithmetic scale, equal distances represent equal amounts; thus the distance from 1 to 2 is the same as the distance from 2 to 3, 3 to 4, and so on. On a logarithmic scale, equal distances represent equal ratios. For example, the distance from 1 to 2 is the same as the distance from 2 to 4, 4 to 8, 8 to 16, and so on - in each case a ratio of 1 to 2.

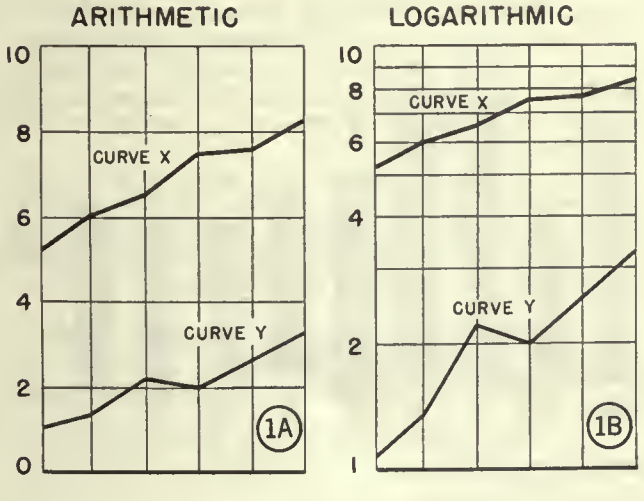
This property of a logarithmic scale is valuable for two reasons: (1) on this scale a series of constant percentage changes appears as a straight line; (2) equal relative changes always take the same angle of change whether occurring at the top or bottom of the chart. These are really two ways of saying the same thing, but they lead to two different uses of this type of chart.

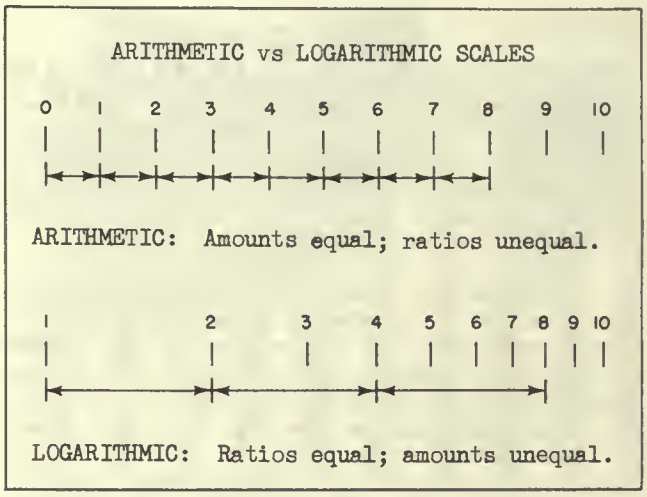
The first use is in the mathematical projection of trends. This is a technical use appropriate only for certain kinds of data in a special kind of time series analysis. It is not useful for most statistical reporting.

The second use is in comparing relative changes (of a single series of data at different times, or of two or more series at the same time). This kind of presentation is sometimes appropriate for recurring Army reports.

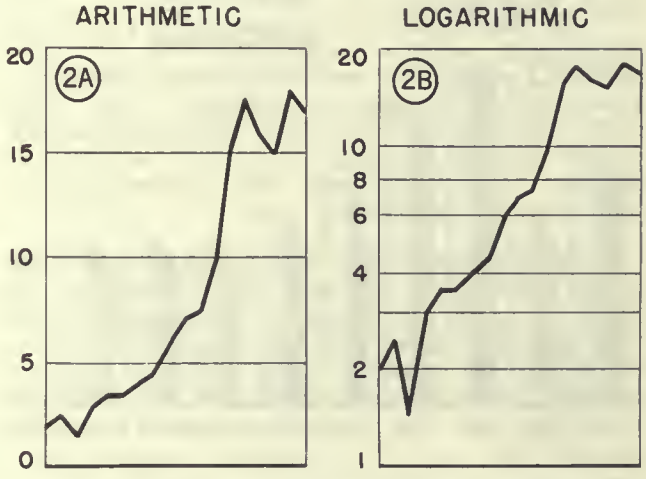
If, for example, the relative change in workload has been more or less than in personnel, or if deliveries of item X have increased at a faster or slower pace than Y, a logarithmic chart will show this very clearly. Chart 1B demonstrates these relationships.

Charts that have a logarithmic amount scale at the side and an arithmetic scale at the bottom are called semi-log charts. They may have one "cycle" which has amount scale captions ranging from 1 to 10 (and multiples thereof) or two or three cycles with ranges of 1 to 100 or 1 to 1,000.




ARITHMETIC vs LOGARITHMIC SCALES
0 1 2 3 4 5 6 7 8 9 10
ARITHMETIC: Amounts equal; ratios unequal.
1 2 3 4 5 6 7 8 9 10
LOGARITHMIC: Ratios equal; amounts unequal.

The following illustration shows another valuable use of semi-log charts. Note that small amount changes at a low level may be more important relative to their level than large changes at a high level. This kind of perspective can be gained only from a chart like 2B. It is especially helpful in evaluating data that increase from a low to a high level.



Charts that have logarithmic scales on the bottom as well as the side are useful for studying certain production quantity-cost relationships, such as those for aircraft and missile items. These are called learning or progress curves.

The virtues of logarithmic amount scales can be important; but they are gained at a cost. Since most people expect a level twice as high to be twice as great, they can be badly misled by logarithmic charts if they do not understand that they do not show that kind of comparison. Logarithmic charts cannot be used to show zeroes or minus figures. They are not as easy to construct as arithmetic charts. Also, log-scale charts look technical and discourage some readers from trying to understand them.

For these reasons they are not recommended for widespread use. They are, however, excellent for the specialized purposes discussed above when it is fairly certain that the user understands their peculiarities and significance.

CHART STYLE

Style - the manner of presentation - is an important factor in chart design. It is not something a chart may or may not have: all charts have style of one kind or another. However, the same data can be presented in many styles: plain or fancy, bold or delicate, conventional or unusual, geometric or pictorial.

Style should always serve a purpose other than novelty. Introducing style flourishes to attract attention or to disguise the fact that the chart is a chart will distract the reader rather than help him get the idea it contains. The right style is the one that best fits these two conditions:

1. The purpose of the chart and the kind of audience it is designed for.
2. The means of presentation (either report or display, etc.).

Of the two, the first is the more important in setting the basic style; the second usually requires merely an adjustment of the basic style to fit the physical means of presentation.

Style and Audience

The importance of style should not be overemphasized; often a chart styled for one audience will serve very well for others. Nevertheless, style can make a difference. The wrong style can make a chart seem inappropriate and out of place: an inept style can obscure the purpose of the chart, or even discourage the audience from reading it.

The accompanying examples illustrate some of the main chart styles. Many variations of each of these are possible, including styles that make use of color, photographs and other art work, and numerous other special effects; however, these six are typical and show the general range that can be applied to most statistical charts.

(1) "Statistical" Style. The basic chart style. Useful for a wide range of audiences if the concept involved in the chart is a simple one. Permits finer accuracy and detail than most other styles, but should not be used to give approximations the appearance of exactness. It is the best style for audiences accustomed to statistics. The style used in this manual is a simplified version of this form.

(2) "Narrative" Style. A modification of the "statistical" style. Tells the story in the title, the graphic part of the chart serving to demonstrate the statement in the title. An effective style for audiences who must deal in amounts but are not accustomed to the "statistical approach" and so need to have the meaning of the chart interpreted or summarized in words. Writing the text takes time.

(3) "Poster" Style. Useful for training aids, educational displays, briefing charts, and similar uses. This style sacrifices some accuracy and detail for boldness and should be used for audiences who are not concerned with minor variations or intricacies of the data.

(4) "Decorative" Style. Appropriate for use in informational booklets, etc. having other types of illustrations and art work. For audiences who receive charts better if they are "non-statistical" in appearance.

(5) "Three Dimensional" Style. A variety of the decorative style. For the same type of audience, but usually more striking. It is another method of avoiding the "statistical" look. Not recommended because the third dimension often distorts the picture. When the third dimension is not used for decoration but is designed to measure something, the chart becomes more, instead of less, complicated. (See also page 63).

(6) "Pictorial" Style. The farthest removed from the "statistical" style and useful for audiences at the other end of the knowledge scale. This is the extreme method of disguising a chart. The main weakness in straight pictorial treatment is its loss in accuracy. But it is also costly in time and money. Two compromise methods, although not as striking, are more reliable: (1) addition of pictorial material to "statistical" style charts, and (2) conversion of the chart to "pictograph" style (see page 64).

Most of these styles are useful at one time or another, but only the first two are recommended for statistical reports. The so-called statistical style, as illustrated throughout this manual, is the standard for Army reports and all similar working documents.

Style and Means of Presentation

The following summarizes style adjustments needed for the main methods of presenting charts:

Statistical Reports. Includes statistical studies and analyses, operating and other management reports, financial, economic and similar technical publications.

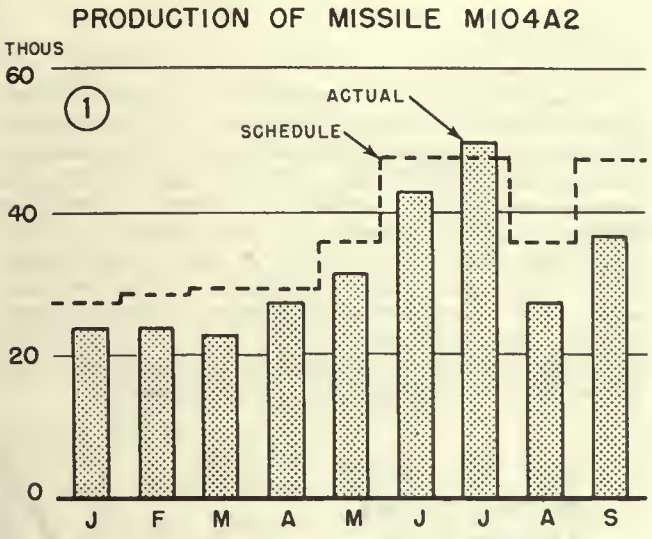
1. Use a style that emphasizes accuracy and completeness rather than popular appeal.
2. Use a style that can be standardized, and will permit rapid production.
3. Use a style that can be reproduced effectively by the less expensive reproduction methods, avoiding color, half-tone, and other costly features.

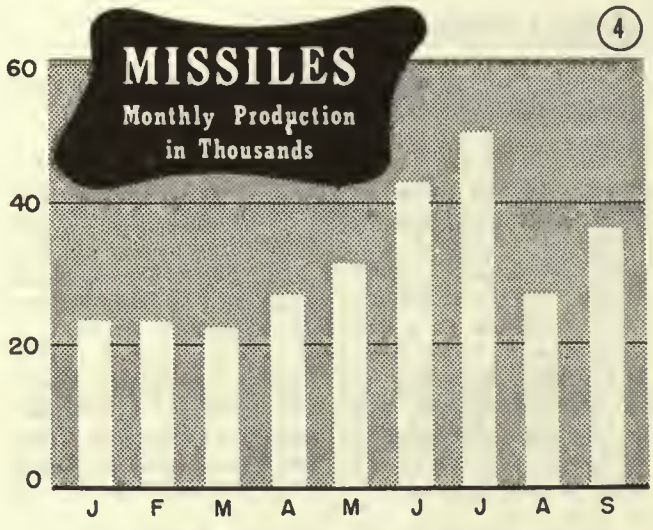
Printed Publications. Includes informational booklets, training manuals, and similar publications that are not primarily statistical.

1. Adjust the style to match the general style of the publication. Make it bolder or more restrained, larger or smaller, simpler or more elaborate, as needed.
2. The lettering may be handled in a style similar to that used in the rest of the publication. Use the same kind of type and follow the specification of the publication as to size and placement, particularly of titles.

Exhibits and Displays. Includes lecture, briefing and conference charts.

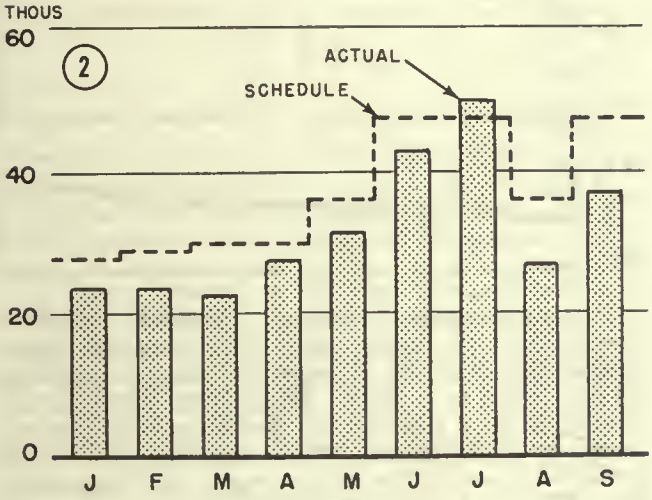
1. Simplify these by eliminating unnecessary detail.
2. Make all lettering big and bold and read horizontally.

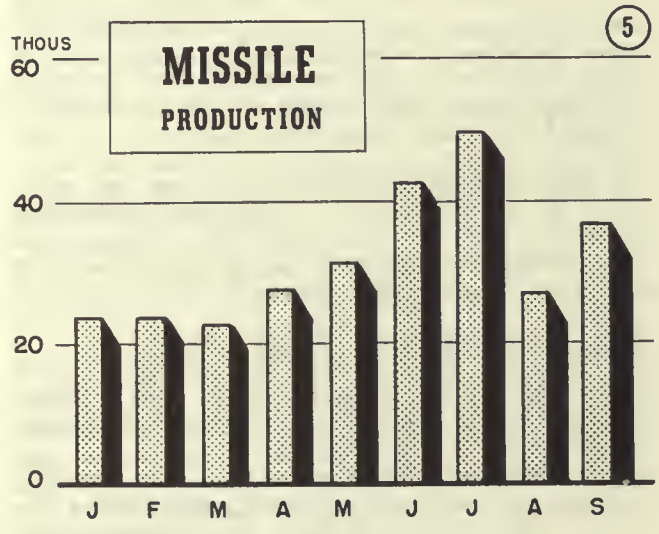


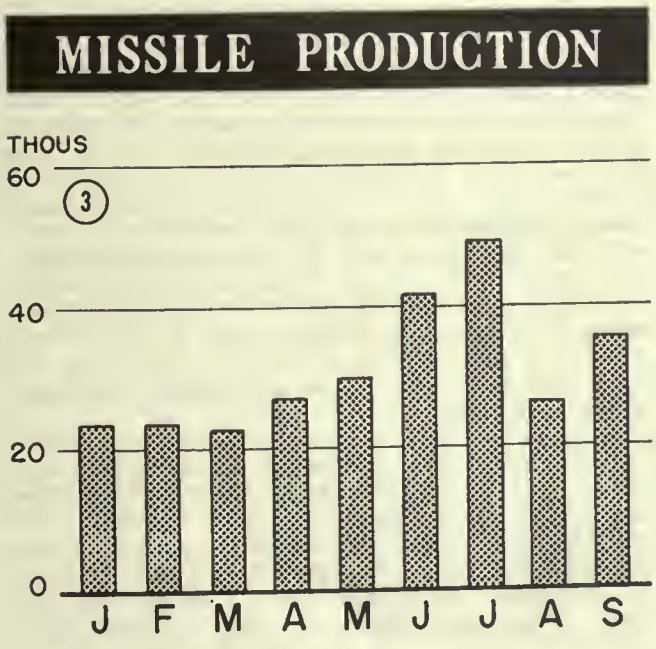


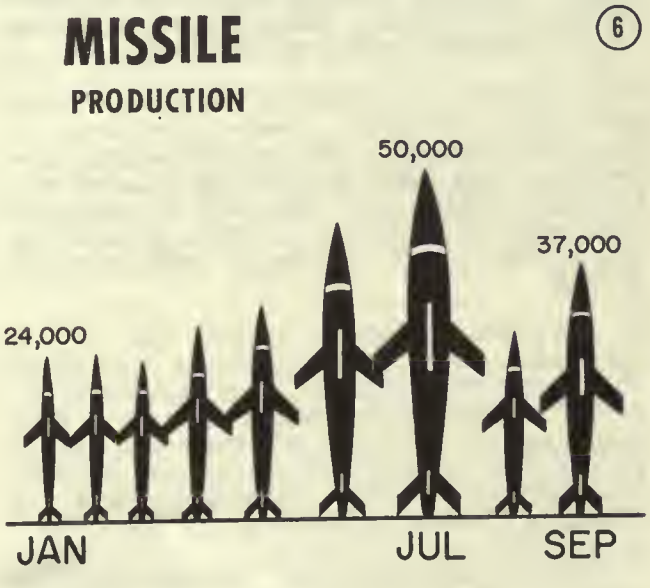
MISSILE PRODUCTION UP-STILL BELOW SCHEDULE

Retooling delays are still slowing production of the redesigned Missile M104A2; October is expected to be up 5,500; 8,000 off schedule.









NOTE: The data plotted in these charts are purely fictitious.

CHART CONSTRUCTION

This section of the manual tells how to lay out, space, and draw charts.

Some of this information is mainly of interest to the person who draws the final chart. But some of it, especially the parts about size, proportion, and scale selection, is about things that the analyst must consider also. In fact, these are construction matters that the draftsman is seldom in a position to decide alone.

The Draftsman's Part in Graphic Presentation

The draftsman has a key part in chart construction. Although no amount of drafting skill can make a poor chart good, poor drafting can ruin a good chart.

Drafting skill is more than the ability to draw a clean line and to make and space lettering properly. It is the ability to understand what the analyst is trying to achieve graphically, and to produce this result.

This means that the draftsman can do a first class job only if he knows what the chart is about, and, to some extent, why and how it is going to be used. Unless the analyst provides this background information, no draftsman can be expected to do his best work.

With a working knowledge of what the chart means and what purpose it serves, an experienced draftsman will not only carry out the analyst's ideas more effectively but will suggest ways to make them even more effective

Why Construction Standards are Valuable

The last part of this section shows drafting specifications for lettering, line weights, curve design, and shading patterns. These standards are useful in three ways:

1. They help to get work done more smoothly by providing a standard way of doing it.
2. They help to produce better charts, by using the best graphic practices.*
3. They help to make the charts easier for the reader to understand and use, by following accepted conventions of chart construction, and by presenting similar information in a uniform way.

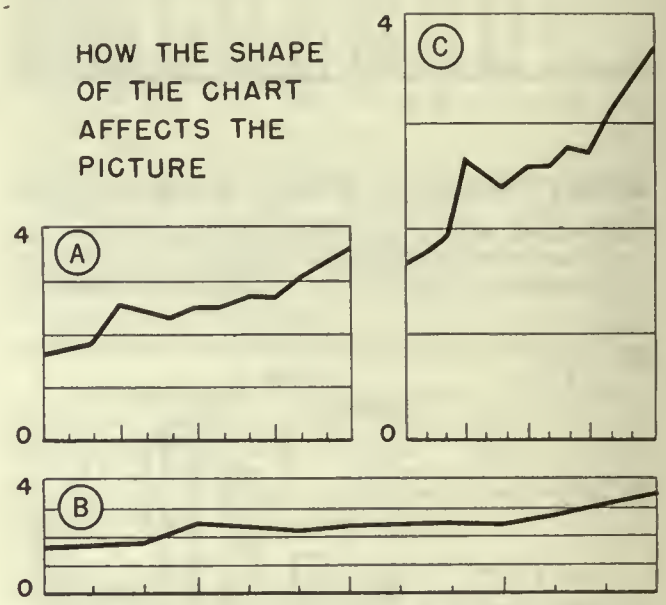
Therefore, the standards should be followed as a regular procedure. However, they should be used with judgment. The specifications recommended in this manual are intended to serve as a help, not a hindrance. There will be times when they cannot be followed, or when the chart requires some change in them to meet a special problem.

But these standards should work well in most cases. As a general practice they should be followed closely for all Army statistical reports that are to be reporduced. Even when charts are not presented in printed publications or when they are made in less finished form, the principles behind these standard specifications should be followed if possible.

* Practices approved by the American Standards Association have been used as a guide.

GRID PROPORTIONS

The shape of a chart has an important effect on the picture it presents. A short, wide chart flattens a curve and makes the changes in it seem to occur gradually. A tall, narrow chart exaggerates the movement in a curve and makes the changes seem to occur abruptly. Charts B and C illustrate this clearly. The shape of the chart affects all time series charts - curve, column, surface - in the same way. For a horizontal bar chart, these extreme shapes have the opposite effect: a wide chart exaggerates the differences in the lengths of the bars, a narrow chart reduces them.



In most cases, a shape somewhere between these extremes works best. The "normal" grid proportion for the average time series chart is about 2 high by 3 wide. Most of the time series charts in this manual are drawn in that proportion or close to it. This same general shape works well also for the average bar comparison (see page 90 for further discussion).

The regular exceptions to this 2 to 3 grid proportion are: (a) a long time series with a great many plottings, which require a wider than normal chart, (b) a long series of bars, which require a taller than normal chart. As shown on pages 85-86, the standard procedure for a long time series is to make the chart the full width of the page. For a large number of bars, there is no standard chart height, the size varying with the number of bars included (see page 90).

While a 2 to 3 proportion is considered the norm, this is not to be construed as an inflexible rule that must be followed in all but the most extreme charts. The shape can be adjusted where necessary.

If every chart becomes a special case, however, all of the advantages of standard sizes are lost. It is generally best to make most charts approximate the standard proportion and sizes. One reason for this is because it helps to keep less important charts from getting more space - and more attention - than the more significant charts. It also helps to simplify the planning and preparation of the report.

CHART SIZE

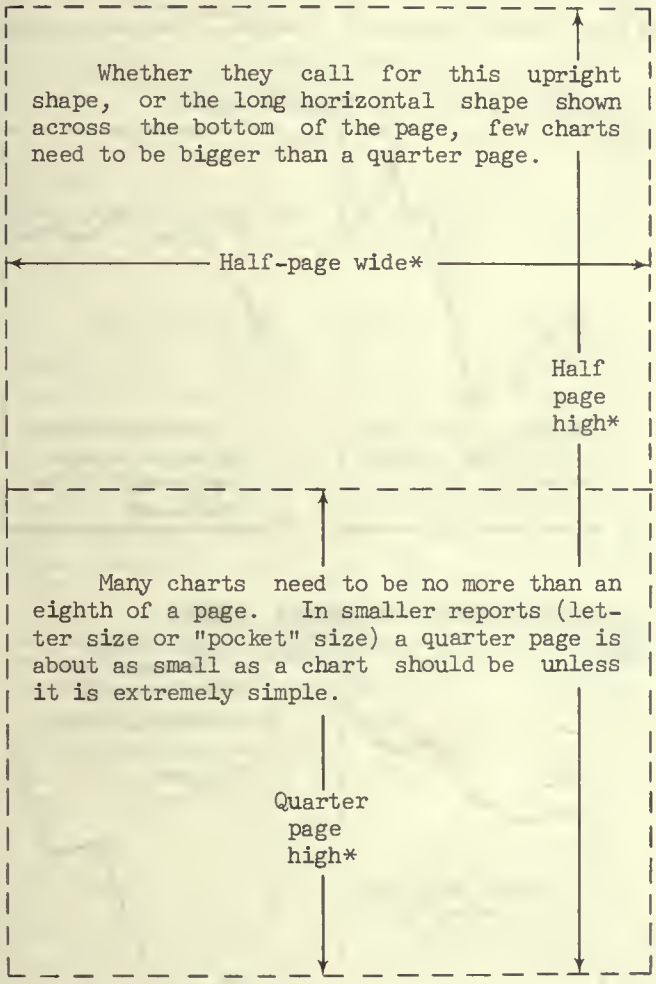
The size of the chart is important for three reasons: it has an effect on how the chart looks, on how much emphasis it gets, and on how it fits on the page. Many chartmakers make the mistake of letting the space control the chart: if there is plenty of space available, it becomes a big chart; if there is very little space, a small chart. Instead, they should choose a size that will:

1. Provide enough space for all parts of the chart to fit in comfortably (but no more).
2. Fit the chart to the layout dimensions used for the report.
3. Give the chart the emphasis it deserves (in relation to other material on the page and to other charts on other pages).

Sometimes 1 and 2 call for a different size than 3. However, it is almost always possible to keep the chart legible, make it fit the page format, and still have it about the right size to match its importance.

NOTE: Complex charts with a lot of detail take much more space than simpler charts. Before designing a complex chart, make certain that it is worth the added emphasis that its size gives it. Often a simpler, summary type chart will be just as effective.

Sometimes a chart looks complex because it is poorly designed. Redesign and simplification of titles and captions will often change an apparently complex chart to one that is simple.


Whether they call for this upright shape, or the long horizontal shape shown across the bottom of the page, few charts need to be bigger than a quarter page.
Half-page wide*
Half page high*
Many charts need to be no more than an eighth of a page. In smaller reports (letter size or "pocket" size) a quarter page is about as small as a chart should be unless it is extremely simple.
Quarter page high*

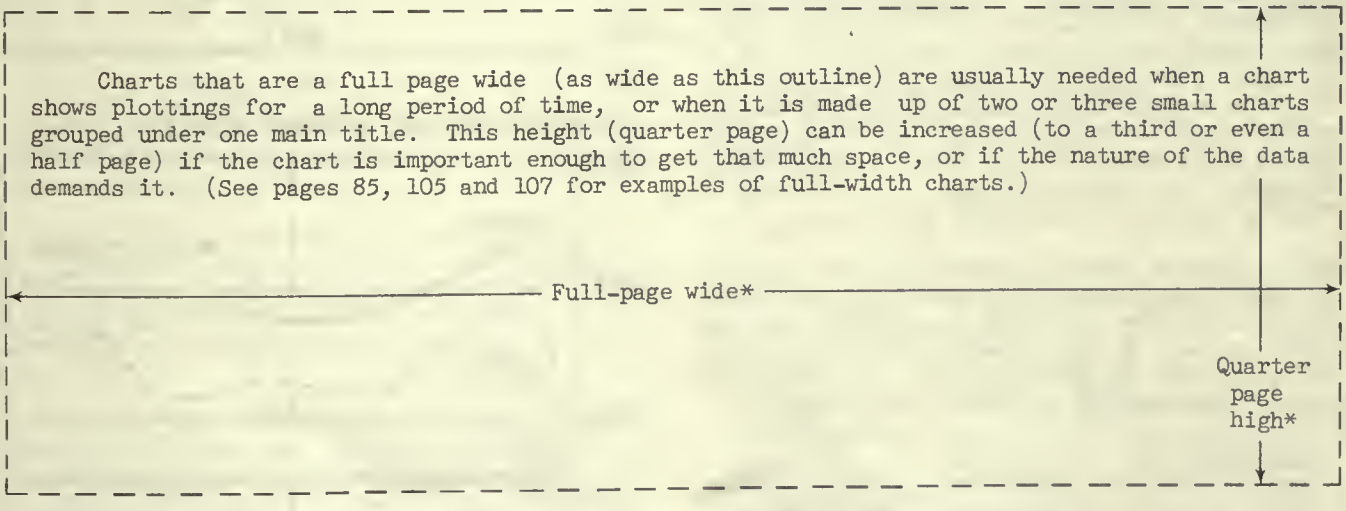
Standard Sizes

As shown on pages 105-107, this manual recommends two standard widths for charts: those that are a full page wide and a half page wide. The half-page width is the same as one column of text or a one-column table when a two-column format is used; the full-page width is the full width of the "copy area" (2 columns plus the white space between).

NOTE: "Width" means width of the entire chart including scales and scale captions.

The specification pages 105-107 show exactly how big to make several typical kinds of charts. Many of the other charts in this manual illustrate how size can be varied to fit the data in the chart and to give the chart the emphasis it is meant to get. For example, pages 80-82 show how small charts can be if they are simple enough.

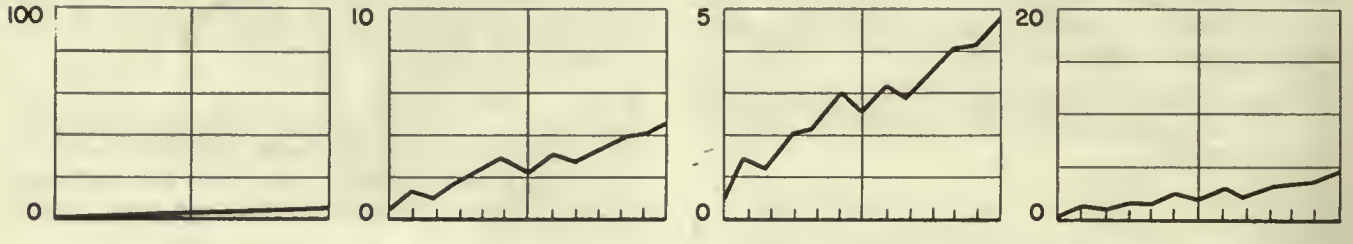
It is generally better not to use nonstandard widths for single charts. However, charts may be paired or grouped to total either of the standard widths, (see pages 59, 62, and 80-82).


Charts that are a full page wide (as wide as this outline) are usually needed when a chart shows plottings for a long period of time, or when it is made up of two or three small charts grouped under one main title. This height (quarter page) can be increased (to a third or even a half page) if the chart is important enough to get that much space, or if the nature of the data demands it. (See pages 85, 105 and 107 for examples of full-width charts.)
Full-page wide*
Quarter page high*

* These dimensions would of course be proportionaly smaller in smaller reports.

SCALES

How the chart looks to the reader depends as much on the scales as on the data. The four charts below demonstrate this clearly: they all present the same data; yet, because they have different amount scales, each presents a different picture. Only one can be the best.



There is no simple rule for scale selection. The principle to follow is to try to choose scales that give a true picture of the data considering the nature of the subject and the purpose of the chart. The following four pages tell how to do this, and also explain how to divide scales, and how to arrange and label them.

Although the principles of scale selection are the same for time series charts, frequency charts, and bar charts, the problems of applying these principles are not quite the same, and so they are discussed separately.

Scales for Time-Series Charts

Amount Scale Range is important because it has a direct effect on the height and movement of the curve. Usually the amount scale should begin at zero and extend upward (and downward if necessary) to include the largest and smallest values in the data. Excessive range should be avoided because it depresses the curve, minimizes differences, and wastes space.

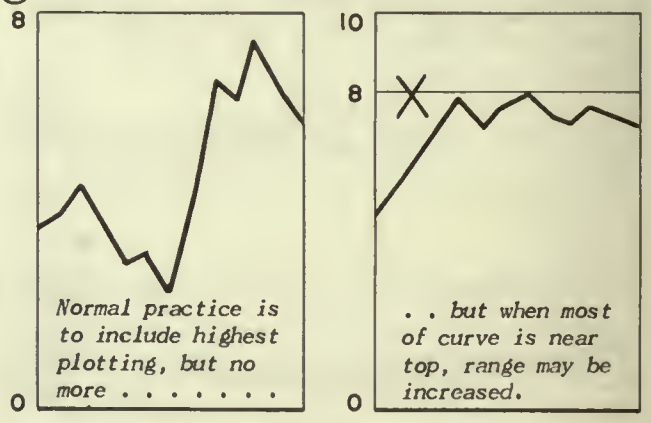
Breaking the Amount Scale (omitting the zero end or an interior section of the scale) is not recommended as a standard practice. It is sometimes useful for analytical "work" charts, to give the analyst a close-up of the changes; but it is not reliable for presentation charts because it is likely to mislead the reader.

EXCEPTION: Occasionally it is necessary to show small but important differences that would be lost if the amount scale extended to zero. One way to show this would be to measure the differences or changes, and picture just that; but sometimes there is an added value in retaining the original scale of measurement. For instance, in a comparison of actual military strength with program, the differences or changes are not only important in themselves but also in relation to the totals. For comparisons of that kind - where small differences between large amounts must be enlarged for close inspection - you can omit an interior section of the salce, using only enough scale range to include the curves.* BUT REMEMBER: a chart drawn in this way is a compromise; it throws the over-all picture out of perspective to provide a close-up of the detail.

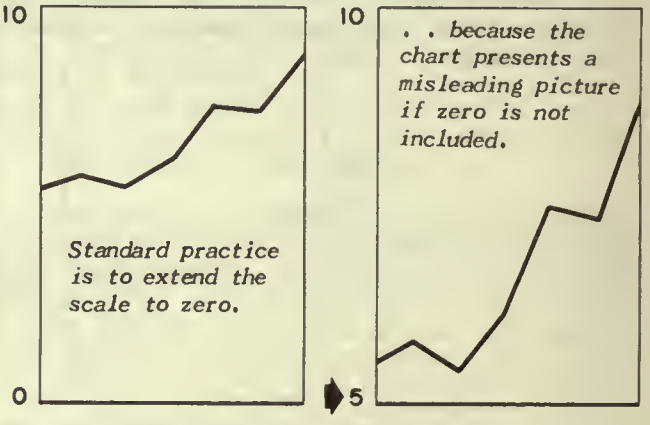
NOTE: When an interior section of the scale is omitted from a chart, you must give the reader fair warning that the scale is not complete. As shown in Chart 3, the standard method is to show the zero end of the scale separated from the rest of the chart by a double "torn" edge.

* Applies only to curve charts: zero or an interior section of the scale should never be omitted in column or surface charts.

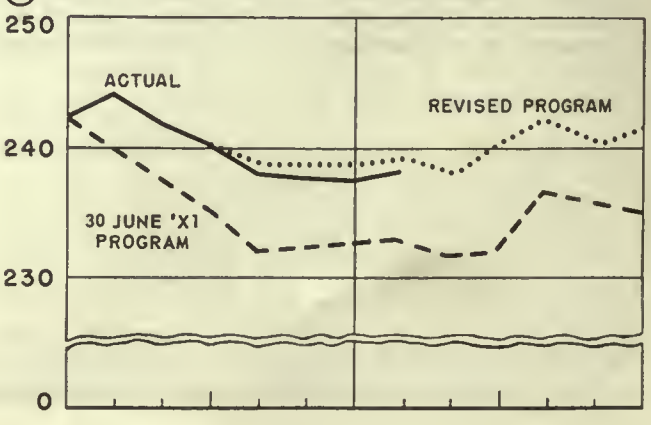
① UPPER LIMIT OF SCALE RANGE


8
0
Normal practice is to include highest plotting, but no more . . . . . .
10
8
0
. . but when most of curve is near top, range may be increased.

② LOWER LIMIT OF SCALE RANGE


10
0
Standard practice is to extend the scale to zero.
10
5
. . because the chart presents a misleading picture if zero is not included.

③ BREAKING THE AMOUNT SCALE



Breaking Curves. Another method of breaking the amount scale is to stop it short of the highest curve value and "break" off the top of the curve. This is permissible if the high point is not significant or if it is the result of some special condition that makes it not comparable with the remainder of the data. Chart 1 shows the same series scaled (A) to include the highest value and (B) to exclude it. Method A is correct if the high point is part of the story; B is correct if the high point is a freak point that should be disregarded.

Cautions: Do not break off peaks merely to increase the movement of the remainder of the curve (use a taller chart). Do not break off peaks that run just a little above the top grid line (unless they would run into the title or some other lettering).

When a curve is broken off, the remaining side-pieces should be slanted as though the value were actually plotted. The amount value of each plotting that is "off the chart" should be shown in small numerals directly above the top grid line.

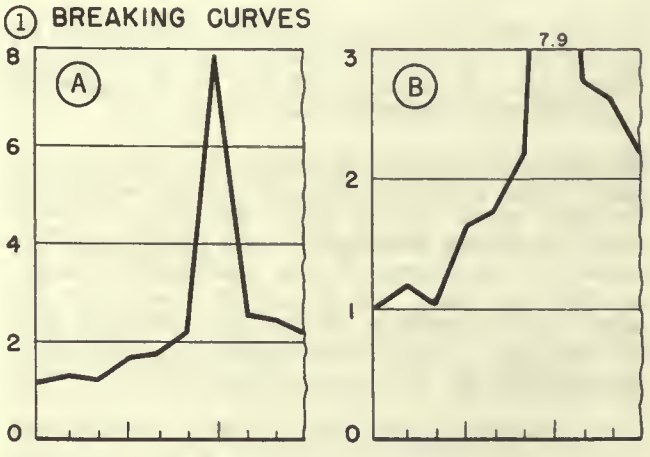
Uniform Scales. Placing comparable or related charts together invites comparisons between them. Comparable scales should be used for charts that are to be compared. If charts are grouped merely for convenience, and a comparison among them is either not possible or not significant each chart may be given an independent scale. However, readers unconsciously compare similar charts placed close together and this should be kept in mind when selecting scales.

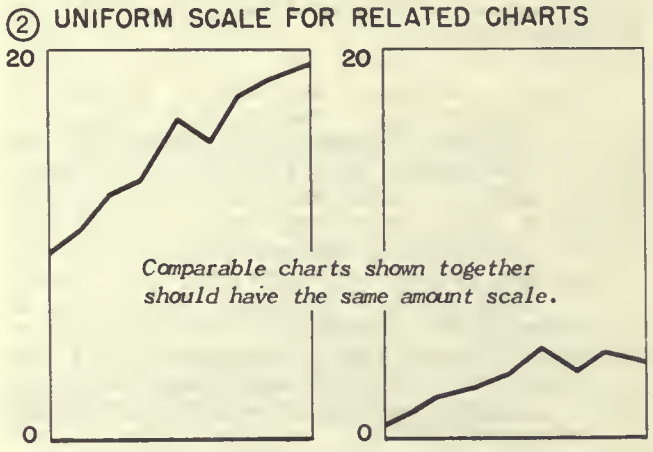
Amount Scale Intervals. The scale should be divided into as many parts as the reader needs to read the chart accurately. Statistical charts, however, are meant to be read approximately - not exactly - and a few scale divisions are usually enough. (See "Scale Rulings," pages 84-85.)

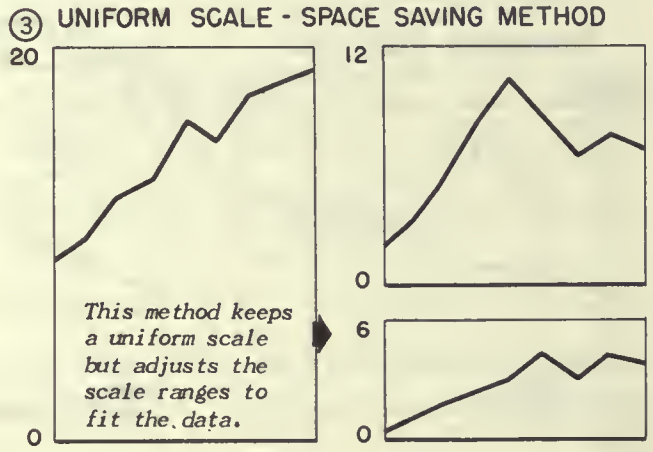
When relatively exact reading is desired, the amount scale should be divided into units of 2 or 4 (or these multiplied by 10, 100, etc.). The reason for this is that 2 or 4 can be easily divided in half by eye, then divided again, for fairly accurate reading. When less exact reading is needed, units of 1, 5, or 25 are better because they are most familiar, especially for measuring money or other financial data. When measuring percentages, units of 10 or 25 are often useful because they provide a 50 percent line (often an important bench mark in percentage comparison).

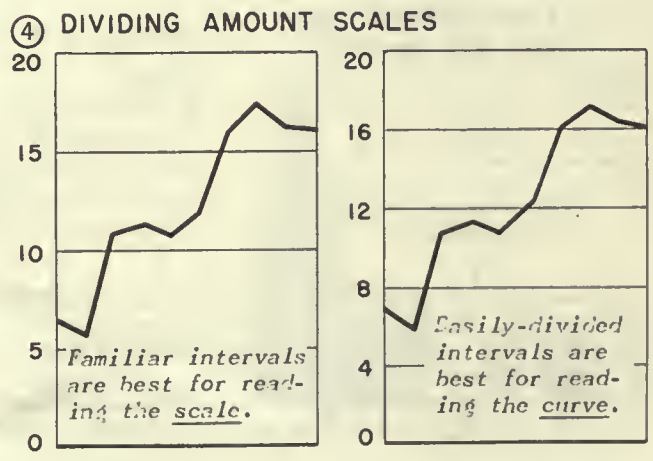
Do not use awkward units such as 7, 11, 13, 17, 19, etc., even though these may provide just the number of horizontal rulings you wish. They are too difficult to use in reading the chart, and produce unfamiliar multiples such as 14, 22, 39, 51, etc.

Units such as 6, 12, 15, or 30, however, may be used when appropriate. For example, it would be logical to measure "time on active duty" in units of 6 or 12 (months), or "rations" in units of 15 or 30 (days of supply).









Location of Amount Scales is standardized as follows: put the scale at the left side of half-page-wide charts, and at both left and right of full-page-wide charts.

EXCEPTIONS: (1) When two charts are used side by side under a single heading, put the scale for the left chart at its left, the scale for the right chart at its right. (2) When there are three or four charts side by side under a single heading do this: (a) if all the scales are the same, show them only at the left and right ends of the row; (b) if the scales are different, show one at the left of each chart.

Amount-Scale Captions should indicate the unit of measurement and should be used to avoid large numbers in the amount scale. They are placed above the amount scales in one or more horizontal lines.

Captions should be kept short. Do this by:

1. Abbreviating: Use MIL SQ FT instead of MILLIONS OF SQUARE FEET; THOUS MEAS TONS or THOUSAND MEAS TONS instead of THOUSANDS OF MEASUREMENT TONS, etc. Be sure to use abbreviations that cannot be misunderstood by the reader.
2. Shortening: Use RATE, instead of INCIDENCE PER 1000 STRENGTH; TONS instead of CAPACITY IN TONS; etc. Use either THOUS ROUNDS or THOUS) whichever fits the ROUNDS) space best. Also use MILLION) instead of (MILLIONS OF DOLLARS $100) (100.

Another good way to shorten long cpations is to put some detail into the subtitle or labels, or simply move it inside the chart. Instead of INDEX: 19X9 100, put only INDEX above the scale, 19X9 100 inside the grid. Or, instead of THOUSANDS OF BARRELS PER YEAR, put THOUSAND above the scale, and use BARRELS PER YEAR as a label inside the chart or include it in the title.

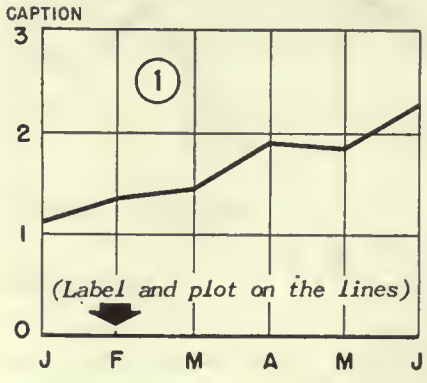
Time-Scale Range should normally begin with the earliest plotting period and end with the latest.

EXCEPTIONS: (1) When the data do not start at a major time division the standard is to begin the chart earlier than the first plotted point. (2) When the chart is to be brought up to date from time to time, the standard is to draw it with room for several future plottings.

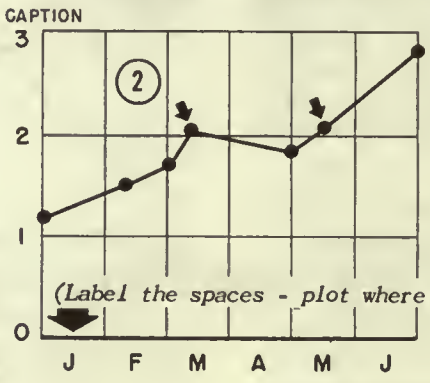
Time Scale Divisions. Normally there is a scale division (but not necessarily a time label) for each plotted point. (The illustrations on pages 86-87 show how this standard method of dividing and labeling is applied to typical time scales.)

EXCEPTION: When data are measured at unequal time intervals (for example, 1 Jan, 15 Mar, 7 Apr, 20 May), the divisions of the time scale should be equally spaced but the data should be plotted "irregularly" (see Chart 2).

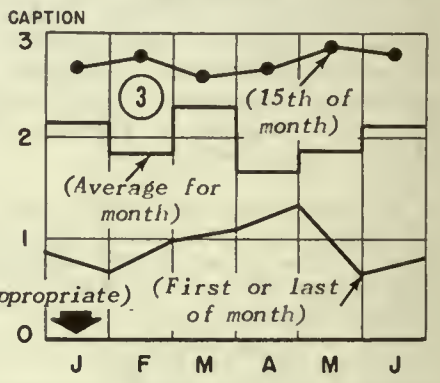
STANDARD PLOTTING



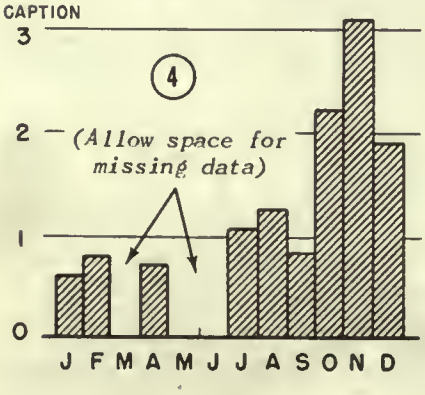
PLOTTINGS AT IRREGULAR INTERVALS



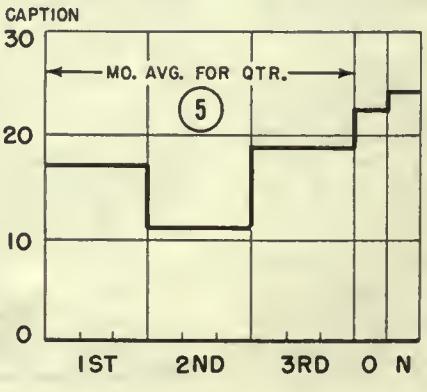
BOTH PERIOD AND POINT DATA



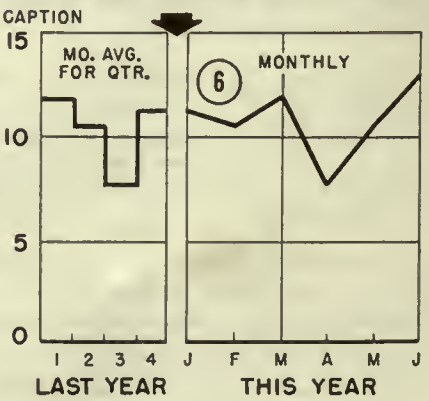
TREATMENT WHEN SOME DATA ARE OMITTED



CHANGE IN PLOTTING INTERVAL



SPLIT SCALE TO SHOW CHANGE IN TIME INTERVAL



When data for both a point in time and a period of time are shown on the same chart, plot the data as indicated in Chart 3, page 82.

When data for some of the time units are omitted (not available, not reported, or not comparable) the time scale should include space for them, and the reason for the omission should be explained in a footnote (see Chart 4, page 82).

When the time unit changes, as: annually to monthly, or quarterly to monthly, space the intervals proportionately. That is, make each year as wide as twelve months, each quarter as wide as three months (see Chart 5, page 82). Otherwise, trends will be badly distorted and changes will seem more sudden and severe in the early part of the chart than in the later part. EXCEPTION: Time intervals need not be spaced proportionately if the chart is separated into two grids: one for (say) quarterly data, one for monthly (see Chart 6, page 82).

The Standard Location of Time Scales is underneath the grid. All lettering should read horizontally.* When time scale labels are so close that they become crowded, abbreviate them or omit some or both (see page 86 for examples of recommended standards).

When two or more rows of charts grouped under the same title have the same time scale, do not repeat the scale on each chart. Instead, place each row of charts close to the one above, and show the time scale for the bottom row only.

Time-Scale Captions are not always needed: but when they are, they should normally be centered below the scale or the parts of it to which they relate. When it is important to call the reader's attention to them they can be moved up inside the grid (usually in the upper left corner). Captions like END OF MONTH, AVERAGE FOR MONTH, can be omitted if their meaning is carried in the chart title. This can also be done with captions such as QUARTERLY or ANNUAL AVERAGES but the explanation must be given somewhere on the chart. (See examples on page 87).

In all other respects, time-scale captions should be handled the same as amount-scale captions, except that abbreviation is not as important because there is usually plenty of space for spelling out.

The standard is to include the caption FISCAL YEAR in fiscal time scales covering more than one fiscal year. It should be spelled out when there is plenty of space; abbreviated FY when space is tight. (See page 86 for examples.)

Scales for Frequency Charts

Three important considerations when planning frequency distribution charts are: the number of groups, the size of the groups, and the method of labeling the groups.

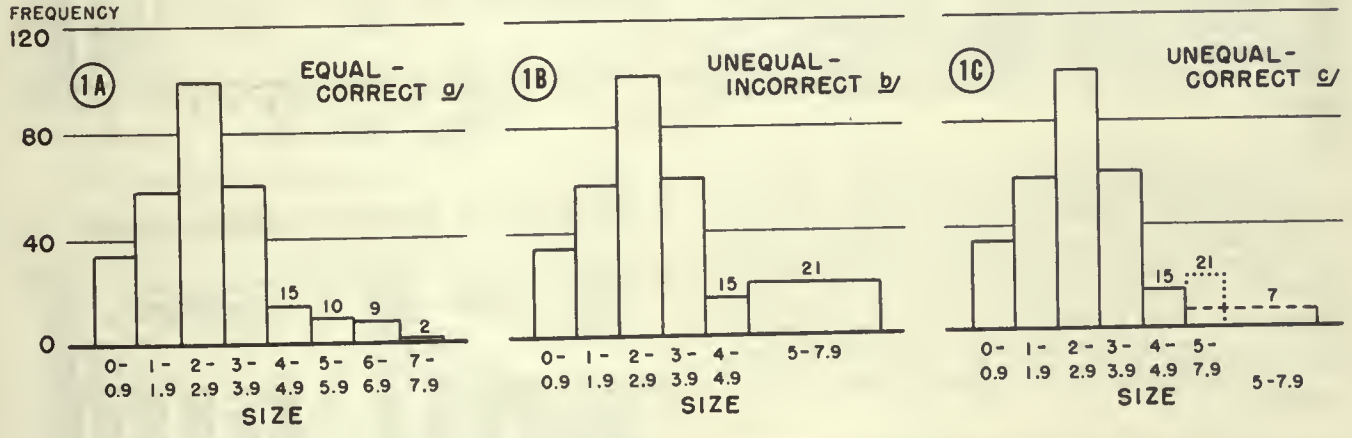
The number of groups is important in bringing out the pattern of the distribution. Too few groups hide the pattern; too many groups break it up. As a general rule do not use fewer than five groups or more than twenty. Ten to fifteen is the best range for most distributions.

Although not a rigid rule, it is generally best to use groups of equal size. Frequently data divided into unequal groups are easily misunderstood, even when drawn properly. (See Charts 1B and 1C below). EXCEPTION: When the data naturally divide into unequal groups, the chart is usually more meaningful if drawn that way. (Example: educational levels.)

The horizontal-scale labels should explain the size of the groups clearly. "Overlapping" labels such as 0-10, 10-15, 15-20, etc. do not tell which group includes the repeated figure. For continuous data, the preferred method is: less than 10, 10 to 19.9, 20 to 29.9, etc. For discrete data, the preferred method is: less than 10, 10 to 19, 20 to 29, etc.

* See examples on specification pages (105-107).

EQUAL VS UNEQUAL SIZE GROUPS



a/ An accurate picture of the frequency in each size group. b/ Inaccurate because not comparable. Total frequency for the enlarged group (5-7.9) should be divided by 3 to show the average frequency per 10-unit group. c/ The dashed line shows the standard method of showing the enlarged group. This preserves the general pattern of the distribution. The dotted outline shows an acceptable method more suitable for analytical and administrative use: retaining the total frequency but compressing the group to the standard width.

SCALE RULINGS

Vertical and horizontal rulings or scale lines should be used to guide the eye in locating and reading points on the chart. Do not use too few or too many of them.

Some people like to show a grid ruling for every division of the scale. This is fine for mathematical or engineering charts (or even for some statistical "work" charts) but not for statistical presentation. Closely spaced rulings are not needed on charts intended primarily to show relationships. When close measurement is needed, the values should be shown in an accompanying table. Too many rulings clutter the chart and make it harder instead of easier to read.

On the other hand, a complete lack of inside rulings is not good either. Although a chart is primarily a picture, the reader should be able to gauge the approximate amounts represented by the graphic part of the chart. This is hard to do without rulings to guide the eye. Also, the picture may be misleading if it does not have enough rulings. Chart 2 shows how an optical illusion can mislead the eye: the difference between the two curves is exactly the same in March and in September. If horizontal lines are drawn through these plotted points, it is evident that this is true.

Most curve and surface charts should have at least 2 or 3 vertical rulings and 3 or 4 horizontal ones. Extremely small charts, however, do not need inside rulings.

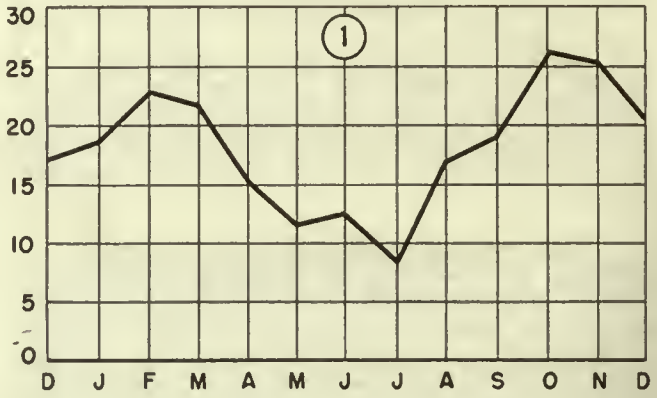
Few charts need more than 8 or 10 vertical or horizontal rulings.

There is no easy answer to the question "How many rulings is the 'right' number?" Charts that are to be read precisely need more rulings than those meant to give only a general picture; tall charts need more rulings than short charts; wide charts need more than narrow ones. The illustrations on the next page show how to apply these principles to charts having standard widths.

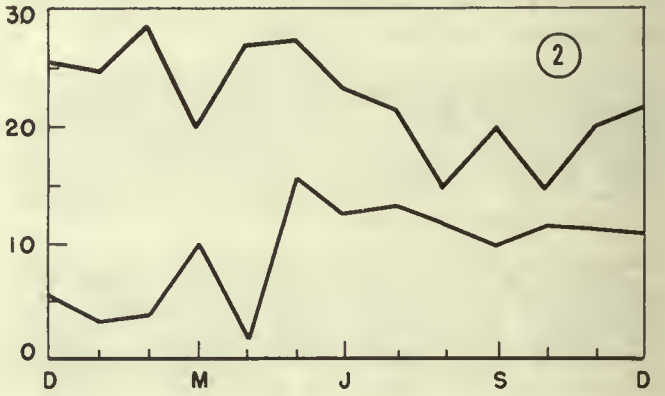
Special Ruling Problems: Column and bar charts usually need only one set of rulings. Column charts need no vertical rulings because the columns themselves serve the same purpose. EXCEPTION: When a column chart is paired with a curve chart, as in illustration 3, end rulings are often used for uniformity. Bar charts have only one scale and do not need a second set of rulings.

Rulings should not cross columns or bars, especially when they are subdivided. As shown in Chart 4, rulings that cross look like division lines and are confusing. Averages, ceilings, authorizations, programs, or other data that appear as a straight line should be treated as curves (drawn through bars or columns).

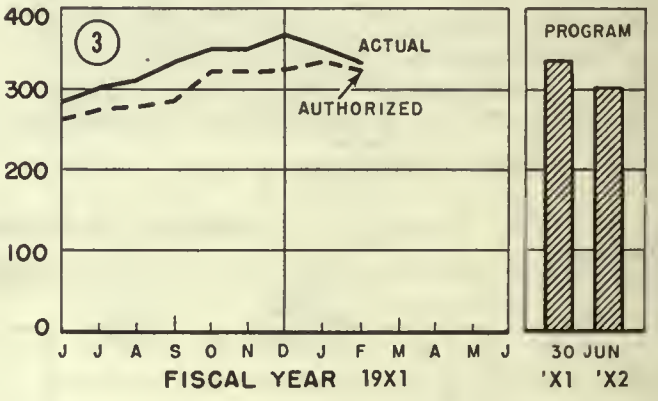
TOO MANY RULINGS



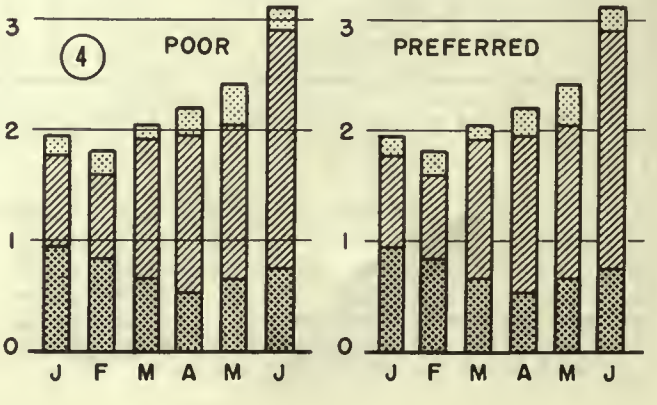
NOT ENOUGH RULINGS

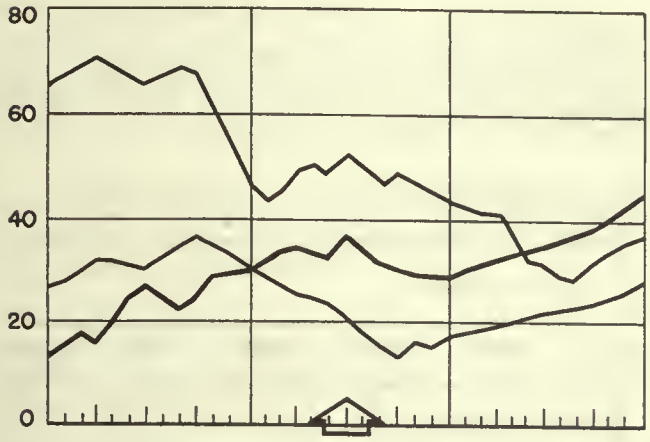


END RULINGS FOR COLUMN CHART

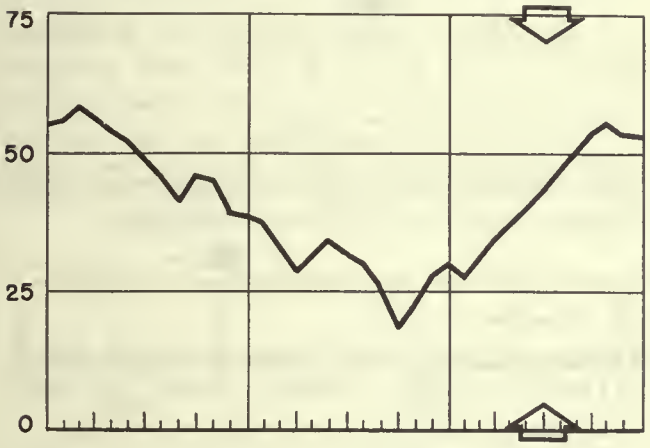


DO NOT RULE THROUGH COLUMNS OR BARS

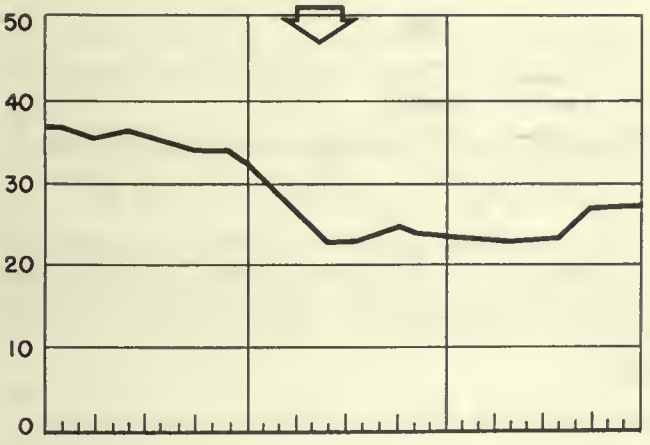




Charts with several curves usually need more HORIZONTAL rulings than those with one curve.



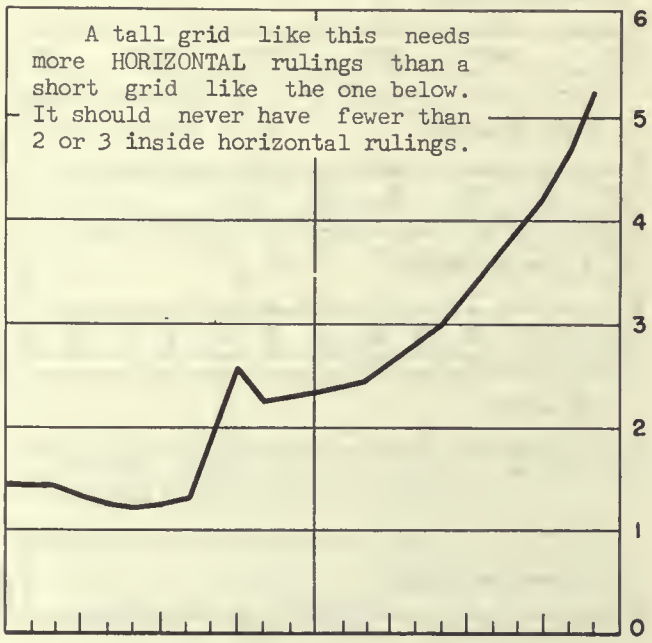
An irregular curve or one that has a wide range needs fewer HORIZONTAL rulings than a smooth, or fairly flat curve.



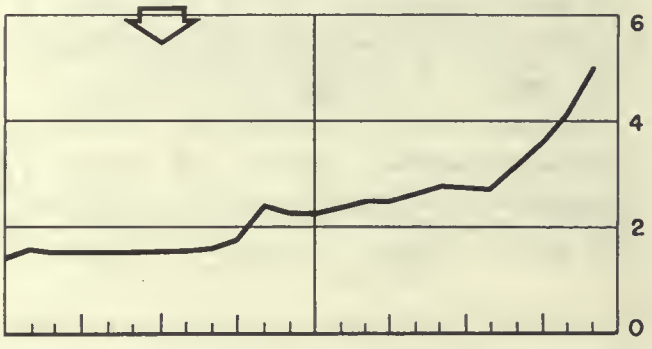
Rules for Curve and Surface Chart Scale Lines

1. The bigger the chart (on the same size page) the more rulings it should have.
2. Use some inside rulings - both horizontal and vertical - except for extremely small charts.
3. Rule all divisions of the AMOUNT scale for which scale numerals are shown.
4. Rule only the key divisions of the TIME scale, following a consistent scheme. (See also the next two pages.)

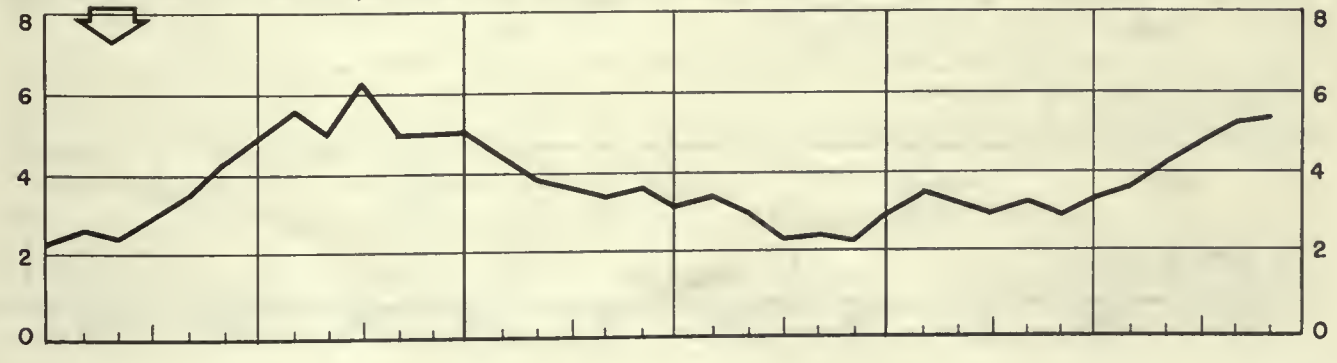
A tall grid like this needs more HORIZONTAL rulings than a short grid like the one below. It should never have fewer than 2 or 3 inside horizontal rulings.



A short grid like this should never have more than 3 or 4 inside HORIZONTAL rulings.



A wide grid like this needs more VERTICAL rulings than narrow grids like those above. Usually it will have more anyway, because wide grids are generally used for longer periods of time; but no matter what the time scale, wide grids should have more vertical rulings than narrow grids.

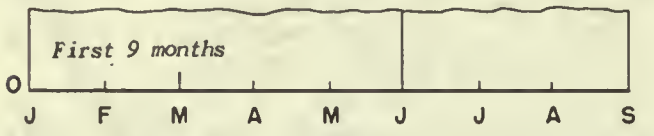


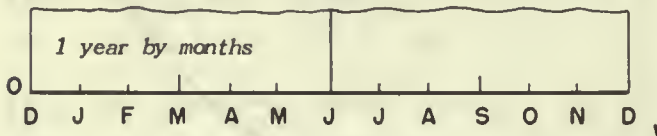
TIME-SCALE DESIGNATIONS AND RULINGS

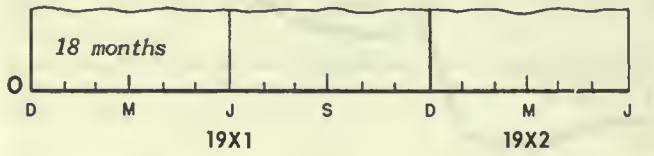
Time-scale designations and captions should always read horizontally. Label every month in time ranges up to one year; every third month in ranges of 15, 18 or 24 months.

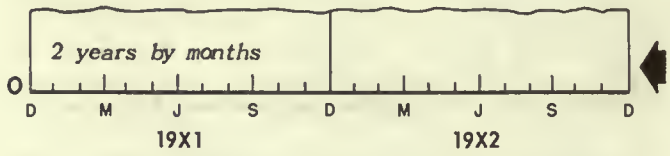
Year labels are not used unless the chart covers more than one year: for a year or less, the year is usually put in the chart title. NOTE: do not repeat years in the title if shown in the time scale.

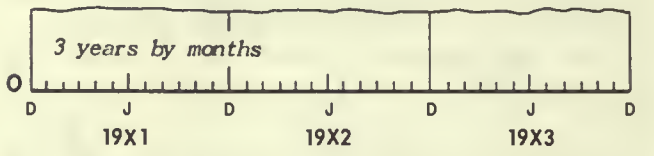
Calendar Year Data

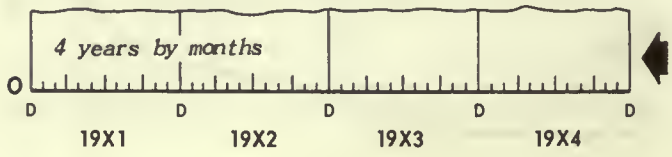




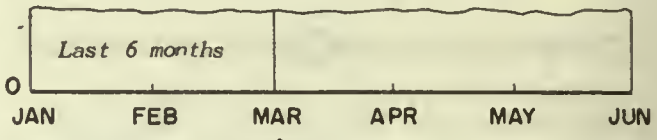






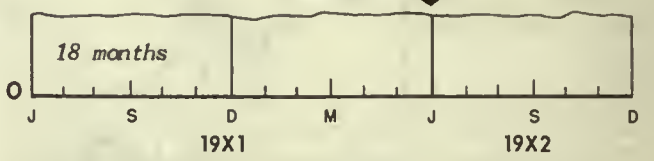


Fiscal Year Data

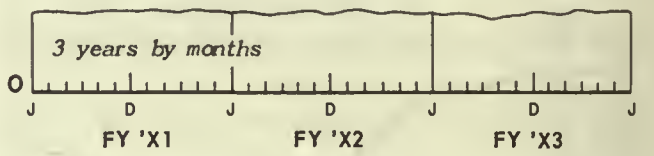


Use rulings only for major time divisions; "ticks" for the in-between months.

Note that year-end lines are heavier than other monthly lines when there are more than three vertical rulings. This holds for both calendar year data and fiscal year data.

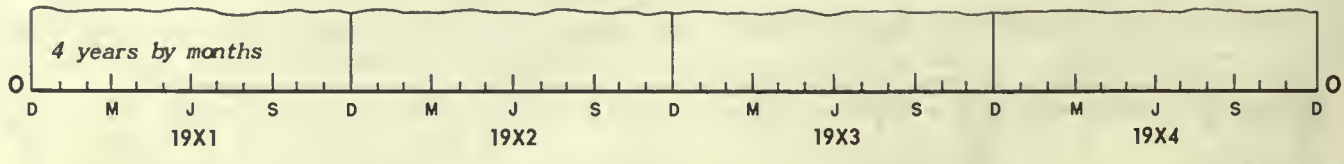


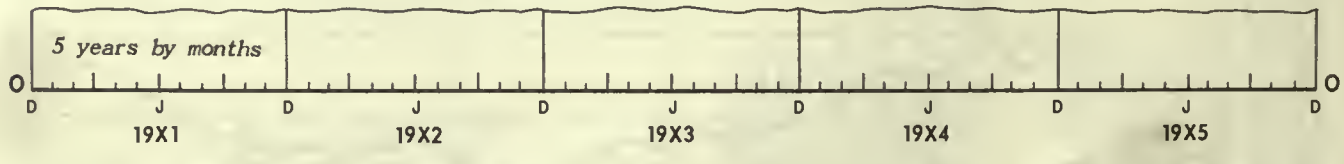
Note that year-end lines are not heavy when they are the only rulings.

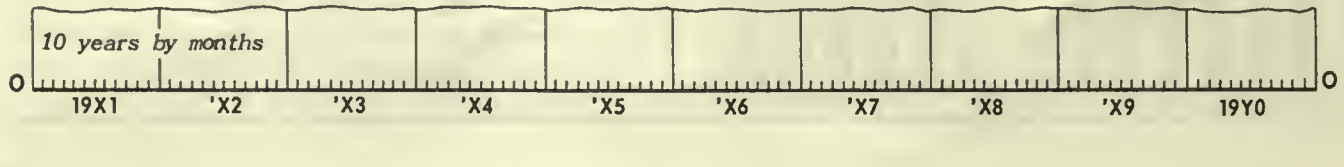


Four years by months is about the limit for a chart that is half a page wide. A longer period could be covered if data were for longer intervals (quarterly or annual data).

Note that full-width charts take more scale labels than half-page charts covering the same period.



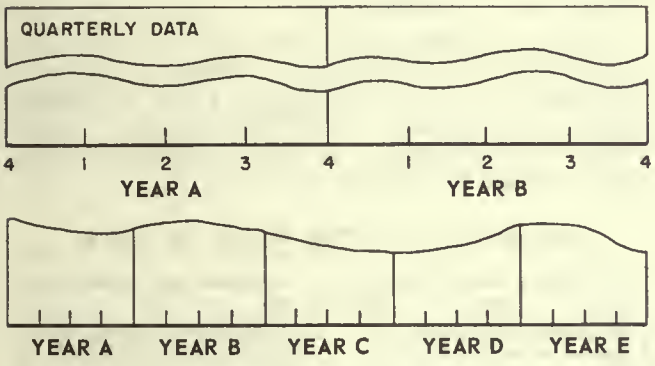


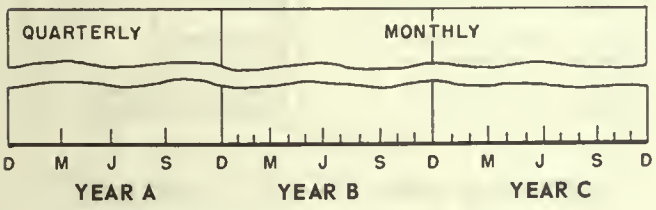


Time scales for quarterly and annual data are labeled in the same general way as monthly data. The number of labels increases as the number of time divisions increases, but when the scale becomes crowded some labels may be omitted.

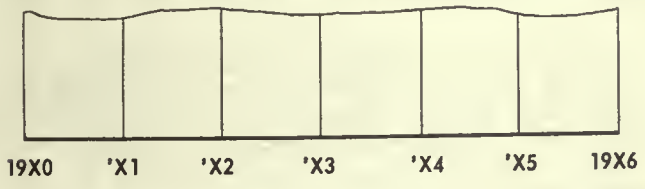
Quarterly Data.* In time scales up to three years long, each quarter should be labeled; but for scales four or more years long, quarterly labels should be omitted.

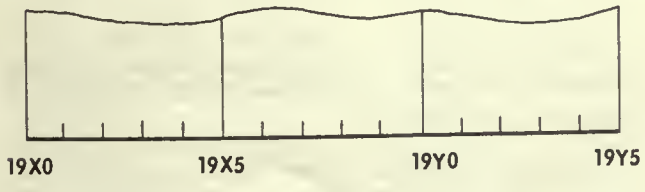
NOTE: The standard method is to use number labels (1, 2, 3, 4, without QTR) and use the caption QUARTERLY DATA in the upper part of the grid. When both monthly and quarterly data are shown on the same chart, label the scale with monthly designations and include the words QUARTERLY and MONTHLY in the appropriate portions of the grid, as illustrated below:



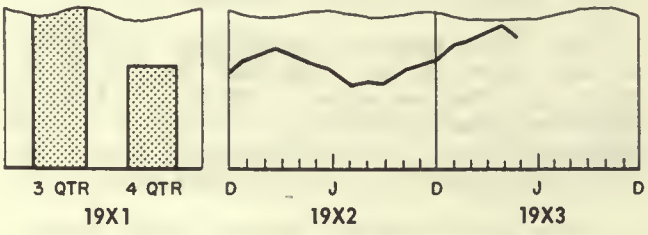


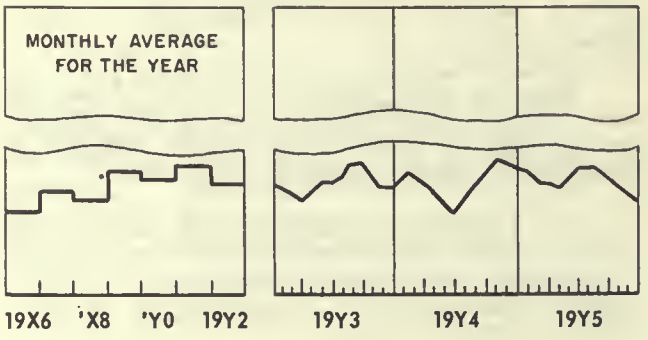
Annual Data.* For time scales up to five years long, label every year, using four digits. For scales that are six to ten years long, label every year, but only the first and last with four digits, omitting the 19 in all others. For scales over ten years long, label every fifth year (see illustration). For very long time scales (50 or more years) label only every 10th year.





Split-Scale Charts. These should follow the system used for continuous time scales, omitting some labels as the scale range increases. The illustrations below show how to handle special cases.



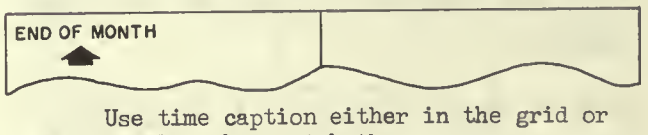


General Procedures. The following standard methods are recommended for general use:

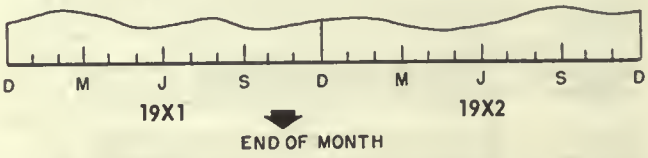
TIME SCALE CAPTIONS: When needed, put caption in the grid or below the time scale but not both. EXCEPTION: Omit it entirely if included in the title. (See page 83.)

FISCAL YEAR DATA: For one fiscal year by months or quarters, spell out (as, FISCAL YEAR 19X6) in the chart title. For more than one year, use FY in front of year labels in the time scale. For annual fiscal data, use the caption FISCAL YEARS under the yearly labels.

UNEVEN TIME RANGE: In "odd" time-scale ranges (such as: 2½ years by months, 23 years by years) always label the first and last time divisions, regardless of how many other divisions are labeled.



Use time caption either in the grid or below scale: but not both.



* Recommended for half-page-wide charts: for full-page-wide charts use the labeling method recommended for half-page charts having half the time scale range. For example, a full page chart covering eight years by months is handled the same as a half page chart covering four years.

214-853 O - 66 - 6

SELECTING SCALES FOR BAR CHARTS

Problems of scale selection for horizontal bar charts are much the same as those for time series column charts (see pages 82-83). Because bar charts have no time scale the scaling relates only to the amount scale.

As in all graphic presentation, the shape of the chart has an important effect on the scale. In a bar comparison, a tall, narrow shape minimizes amount differences; a low, wide shape emphasizes them (a directly opposite effect than these shapes would have on a column chart).

Some bar charts may present scale problems because of poor layout or awkward data. The first problem is unnecessary and can be avoided; and the second is unavoidable, but it can be partly overcome.

Poor bar chart layout may result from too much space in the stub, or careless scaling. The two charts below show typical examples of these faults and how they can be avoided.

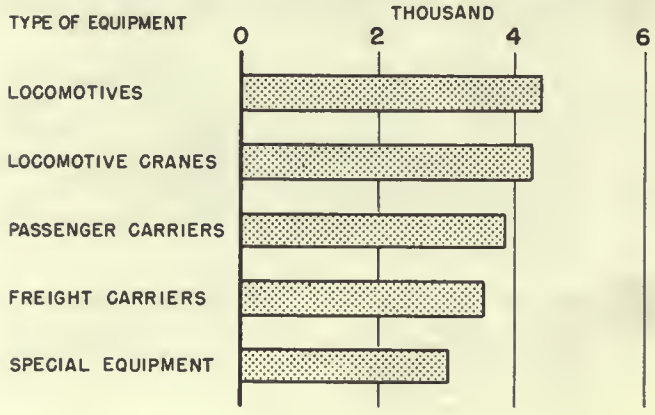
The standard for spacing bar charts is to allot at least two thirds of the chart's width to the bars, to provide space for effective scaling. If necessary, abbreviate stub captions or put them on two lines.

The standard procedure for scaling a bar chart is to let the longest bar come out to the full width of the chart. If this longest bar extends beyond half a scale interval, include the scale ruling for the next scale division; otherwise, let the bar extend beyond the preceding scale division. EXCEPTION: In a series of comparable charts, the scale range should always be uniform, regardless of the length of the bars.

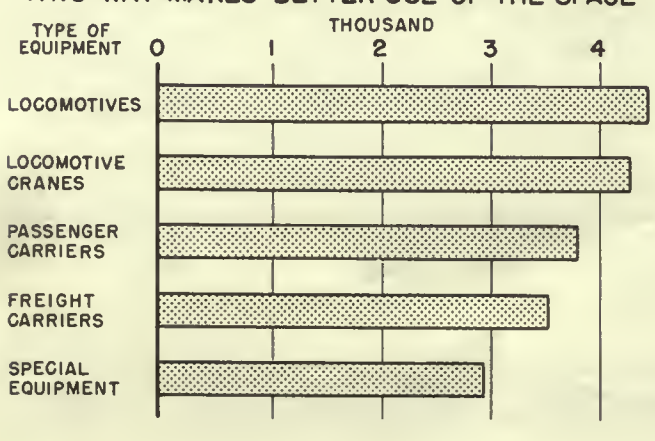
Awkward data may result from too much or too little range between high and low amounts. Two standard methods of overcoming this problem of extreme range are to: use an insert chart to enlarge the smallest bars (see page 72) or expand the scale by "breaking" extremely long bars that the reader either expects to be much longer than the rest, or that are not entirely comparable and therefore need not be shown completely. (See discussion on next page.) The problem of small differences in amounts is harder to solve. As illustrated in the charts below, one way to show up small but important differences is to measure the differences directly and to compare those instead of the totals.

These solutions all aim at the same result: bringing out differences that otherwise would not show up clearly. Caution: it is not always desirable to magnify small differences. Sometimes the whole point of the comparison is that the differences are small.

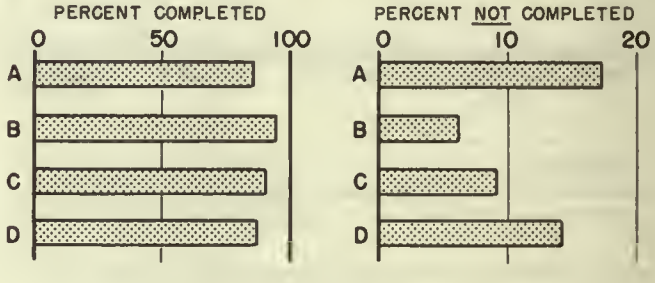
THE WRONG WAY TO SCALE A BAR CHART



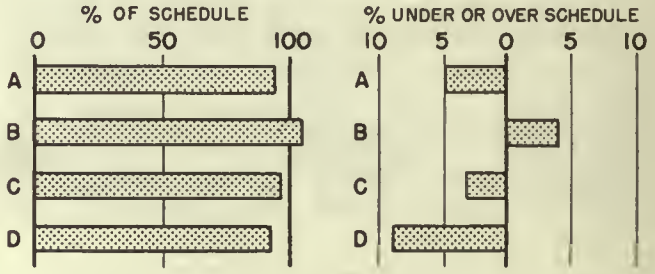
THIS WAY MAKES BETTER USE OF THE SPACE



IMPORTANCE OF THE POINT OF VIEW



MEASURING DIRECTLY VS. INDIRECTLY



Location of Scales. In all bar charts, the scale is shown at the top of the chart directly below the title. When the chart is extremely tall and there are more than 3 or 4 scale rulings, repeating the scale at the bottom of the chart may make it easier to read.

Scale Numerals. These are centered above the scale rulings. Special care should be taken to shorten numerals to prevent them from running together (see page 82).

Scale Captions. The standard procedure is to use a scale caption for all bar charts. The caption should be centered above the scale numerals. No caption is needed for a scale that is repeated at the bottom of a chart.

BREAKING BARS AND COLUMNS

Usually the only good reason for breaking a bar or column is that it is a "freak" and not comparable with other bars. Typical examples: a bar showing a high accident rate because of one accident in a small installation; or a bar showing a large amount of unobligated funds resulting from the cancellation of a major contract.

Before breaking bars or columns, be sure that the important point of the chart will not be lost in the process: the fact that one item is much larger than the others may be the main fact that the reader should know.

Broken Bars

If a long bar should not be broken, these three things help: (1) Reexamine the design to see if the best possible use has been made of the space. (For example, condensing a wide stub adds more space to the length of the scale.) (2) Reassay the value of the chart: it may be important enough to increase its size, for example, from a half-page to a full-page wide. (3) See if the chart can be laid out to take a small insert chart that repeats the smallest bars on an expanded scale (see "'Blowup' Insert Charts," page 72).

NOTE: Never scale a chart so that half of the bars will be broken. Do not include a "TOTAL" that is the sum of all the other bars and so will have to be broken (this does not apply to totals that are ratios or averages.) Never break bars by cutting off the base end of the scale, or by cutting out an inside piece of the scale.

Broken Columns

These are used in the same way as bars, and for the same reasons. Typical examples of extremely long columns that could be broken: high lost-time record because of a flood or strike; temporary rise in unit cost because of model change over.

One other problem occurs more often in column than in bar charts: negative values. The standard way to treat negative columns is this: stretch the scale range to include them if the amount of the negative value is important; break them if only the fact that they are negative is important and the amount is unimportant.

How to Break Bars (or Columns)

When the end of a bar must be "broken off" it should be done like this:

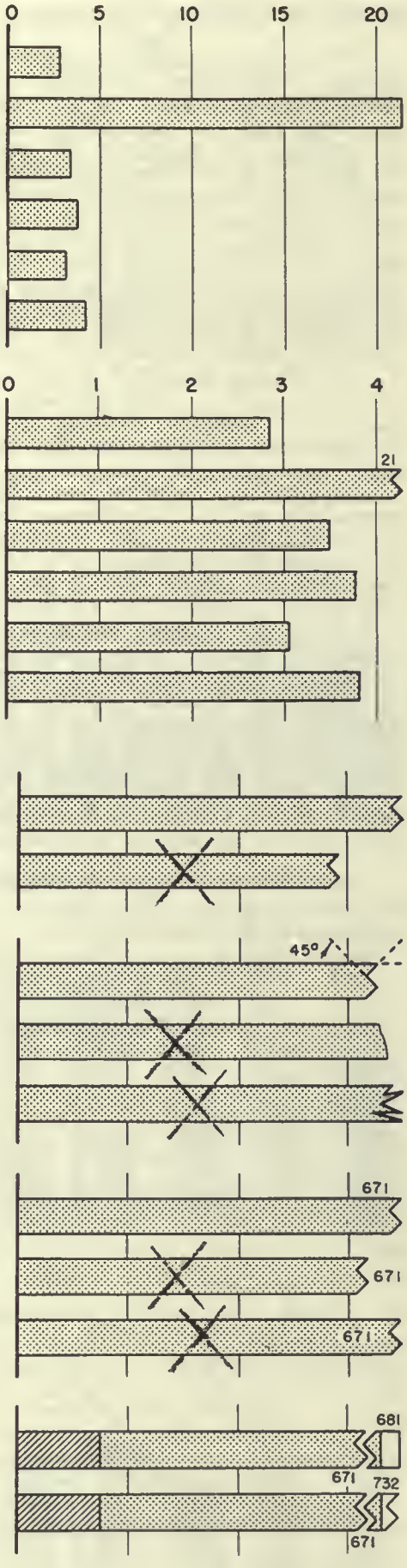
1. Break the bar beyond the last grid line.
2. Use a bold, simple break.
3. Do not show the square "end" of the bar.
4. Show the value of the bar in small numerals, just above or below the break.

Breaking Subdivided Bars

When a bar breaks in the last segment, it should be handled just like any other broken bar. When it breaks before the last segment, follow the method shown in the illustration opposite.

Breaking Bar-and-Symbol Charts

The standard method of showing a circle, diamond, cross line, or other symbol that extends beyond the end of the scale, is to put an arrowhead at the end of the dashed connecting line and then show the figure above or below it.



SPACING BARS (OR COLUMNS*)

There is no single system for good bar spacing. The reason for this is that several things have an effect on how thick the bars seem: the size and shape of the chart, the number of bars, the length of the bars, and even the shading used in them. For example, bars that are the right thickness in a chart 4 inches wide would be too long and thin in a chart 8 inches wide. Satisfactory bars can be designed, however, by following this basic principle: the shorter or closer the bars, the thinner they should be; the longer or farther apart the bars, the thicker they should be.

The spacing patterns at the right show how this works out for half-page-wide bar charts. These same spacings could be used for column charts up to a third of a page high; but for wider bar charts or taller column charts the bars or columns should be made a little thicker in relation to the space between them. A good way to do this is to use the next higher ratio (for example 3 to 2 instead of 4 to 3) than the one recommended in the pattern chart.

A simpler system is to reduce the number of spacing patterns to, say, three: one for only a few bars, another for a moderate number of bars, and a third for a larger number. This method is easier for the draftsman to carry out and works fairly well in most cases, but requires some adjustment for charts that are much larger or smaller than the "normal" size. Many of the charts in this manual were designed by this three-way spacing system, as follows:

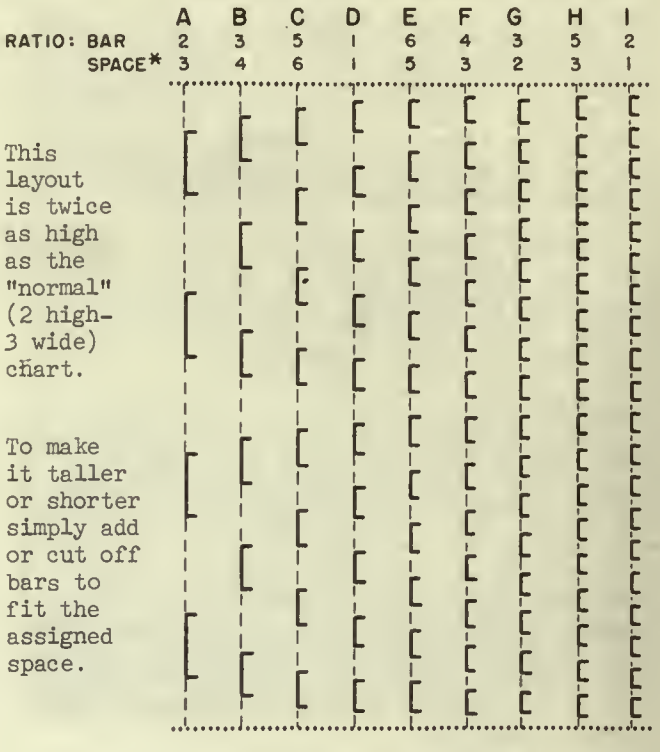
For a standard half-page-wide bar chart - half as tall as the pattern chart - (see page 78 for discussion of grid size):

2 or 3 bars: bar - 2 units of space, space between bars - 3 units of space, space above first bar and below last bar - 1½ units.
4 to 8 bars: bar-3, space-2, end spaces-2.
9 or 10 bars: bar-2, space-1, end spaces-1.

For more than 10 or 11 bars, use a taller chart; for these same numbers of bars in a much taller chart, use a ratio that gives a smaller proportion of the space to the bars and a larger proportion to the spaces between bars. When in doubt, remember the basic principle stated in the first paragraph on this page and refer to the examples in the pattern chart.

A still simpler method of spacing is to choose the desired bar thickness and then use one standard spacing ratio for all bar charts, simply increasing or decreasing the height of the chart to fit the number of bars needed. This is a much easier method and has been found generally satisfactory for the average bar chart, using a spacing ratio of 3 (bar) to 2 (space). There are several reasons, however, why this one-ratio system cannot always be used: (1) it may require more (or less) space than is available, (2) it may give the chart more (or less) emphasis than it deserves, (3) no one spacing ratio looks equally well under all conditions.

SPACING PATTERNS


A B C D E F G H I
RATIO: BAR 2 3 5 1 6 4 3 5 2
SPACE* 3 4 6 1 5 3 2 3 1
This layout is twice as high as the "normal" (2 high-3 wide) chart.
To make it taller or shorter simply add or cut off bars to fit the assigned space.

* For the spaces above and below the bars, use from 1/2 to the same as the space between bars.

CAUTION: For half-page-wide charts to be reduced about the same as in this manual (16 percent) do not draw bars any thicker than about 1/2 inch or thinner than about 1/8 inch. Exceptions: (1) connected bars or columns (see page 91) can be as thin as 1/10 inch; (2) since a column chart is spaced along the long dimension of a standard half-page-wide chart, and therefore must fit a larger space, the columns should be thicker than the same number of bars spaced along the short dimension. For example, in a 2-column chart the columns could be as thick as 3/4 inch.

Spacing Grouped Bars (or Columns)

The aim is the same as for ungrouped bars: to avoid bars that are extremely thick or thin. The standard spacing ratio is 1-1-1 .... That is, the space between groups is the same as the thickness of each bar. This applies to 3-bar groups as well as to the more usual 2-bar type. (See pages 45, 55, 65, 71 and 72 for examples of grouped bar charts.)

EXCEPTIONS: When the 1-1-1 ratio would produce thinner bars than in column H, above, the space between groups may be reduced (to no less than ½ the bar thickness)**. When the standard ratio would produce bars thicker than in column B above, the space may be increased to 1½ the bar thickness. However, it is better to change the height of the grid to retain the 1-1-1 ratio with bars about as thick as in columns C-G.

* The material on this page discusses spacing as related to bars, but the same principles apply to columns. Two special problems that apply more often to columns are explained under "Overlapping Columns" and "Connected Columns" on page 91.

** Overlapping bars are a better solution when workable. See page 91.

CONNECTED COLUMNS

Sometimes so many columns must be fitted into a chart that the only good solution is to leave out the spaces between them. The resulting chart is about half way between a regular column chart and a shaded step-curve chart.

This form should be used whenever separated columns would be so narrow that they would be difficult to draw.* In a standard chart, half a page wide, this point is reached at about 20 columns. Two years by months usually should be drawn as connected columns. Three years by months should be a step curve or slope curve. (See pages 46 and 50.)

OVERLAPPING COLUMNS (OR BARS)

Sometimes double columns can be overlapped to good effect. The usual purpose of overlapping is to save space and at the same time to avoid very narrow columns. This is a good design when it is appropriate, a poor one when it is not.

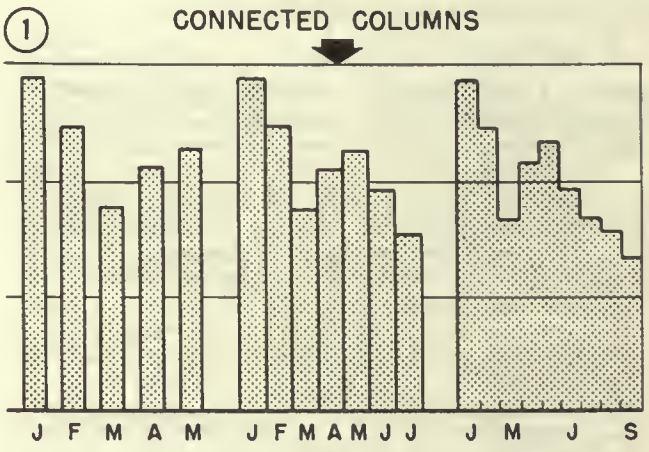
It should be used when each of the front set of columns is shorter than the back set. When a bar in the back column is shorter, it appears to be a narrow sliver at the side of the front column rather than a whole column (Chart 4).

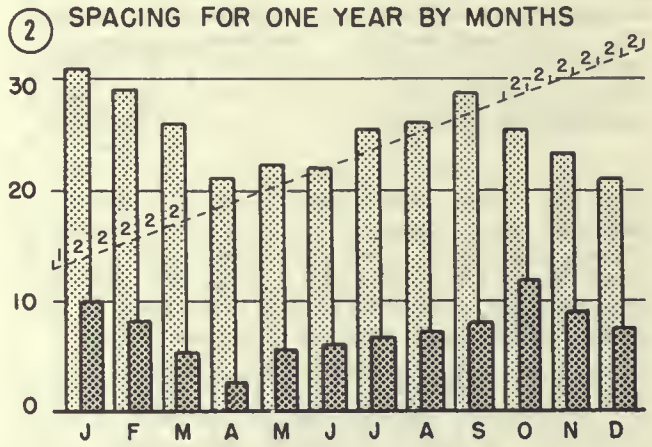
In spacing this type of chart, the standard method is to overlap by 1/2 the column width. This holds each pair together and also makes the spacing easier to lay out. When there are quite a few columns it may be necessary to overlap by 2/3 the column width to provide a clear separation between each pair. Usually it is best to separate pairs by no less than 1/2 the column width.

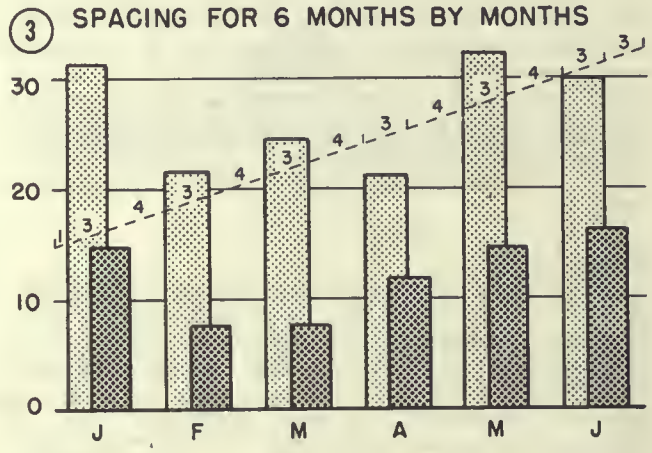
Overlapping is not recommended for subdivided columns unless they are extremely simple. If the columns are divided into more than two parts, the selection of matching shadings becomes difficult. (This is one of the places where color would be effective: background columns of, say, blue, could be shaded with the same series of patterns as the overlapping black columns.)

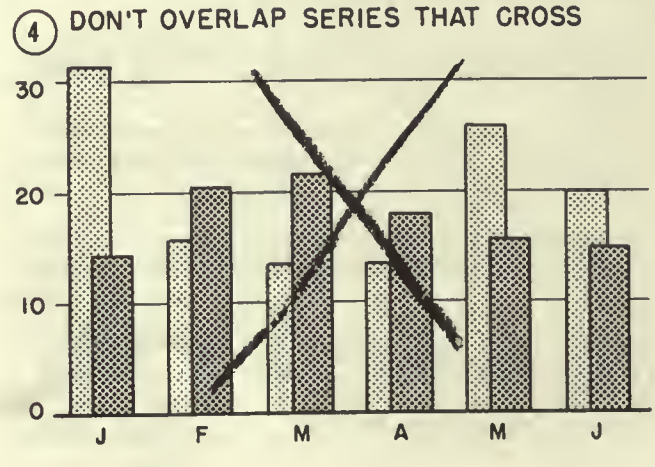
Bars can be overlapped in the same way as columns, but there is seldom as much need for it. The height of a bar chart is more flexible than the width of a column chart, and usually can be increased to avoid the need for overlapping. Exception: If a long series of double bars takes up much more space than the chart warrants, overlapping can be used to reduce the height of the chart, if one set of bars stays shorter than the other.

* Trying to draw a series of narrow columns exactly the same width is trouble enough: trying to keep thin white spaces between them exactly equal takes more time and effort than it is worth. Besides, closely-spaced columns do not look separated anyway: they look like connected columns with a white line instead of a black line between them. · Connected columns are more economical also because they can be shaded much more easily.









HOW TO INDICATE GOALS AND PROJECTIONS

Many types of charts may be used to show goals or projections. Some of these present no special problem (such as Chart 4, page 59 and Chart 3, page 84), but many do.

Two standard methods of showing such data are the "ghost" method and the "signpost" method. Charts 1 and 2 show typical examples of each. Note that in both methods, appropriate labels are used to indicate the type of goal or projection used. Additional labeling to specify dates or other identifying information should be used when needed.

Curve Charts

The ghost method uses a different kind of line or shading for the projection or goal. The standard is a broken line, because this suggests the conditional nature of the data. Sometimes, especially in large display charts, an unbroken line of lighter tone or a different color can be used in the same way.

The signpost method relies on a pointer to tell the reader where the actual data end. It has one big advantage: it permits the use of broken lines for other purposes. Dot or dash lines are often needed for setting off one curve from another, especially when they cross, or when several curves are shown on the same chart.

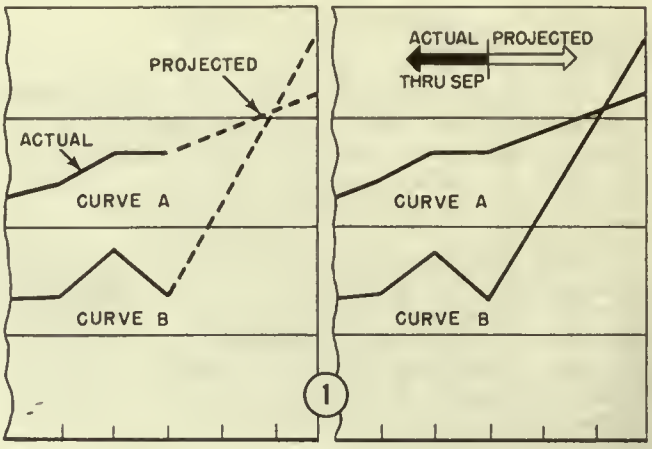
Sometimes broken lines are needed for IF curves in the past instead of the future: for showing what the actual results would have been IF such and such a condition had been met; or what the effect would be IF the data included certain adjustments. For example, an unbroken curve measuring "patient load" might be paired with a broken curve showing the effect of changing the stay of certain classes of patient. Broken lines are useful also for showing averages, standards, or other summary or benchmark data.

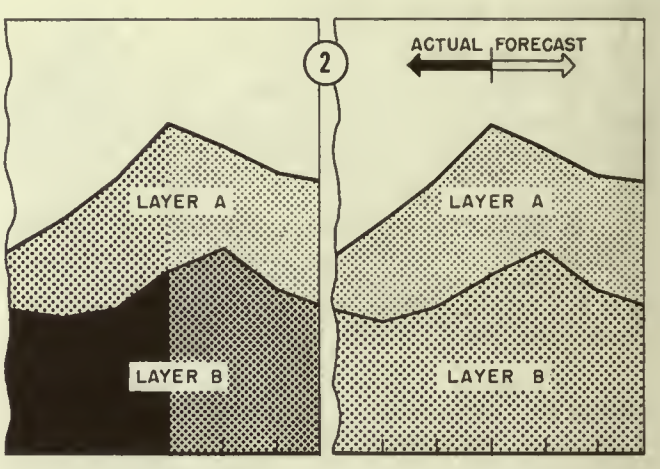
Shaded Charts

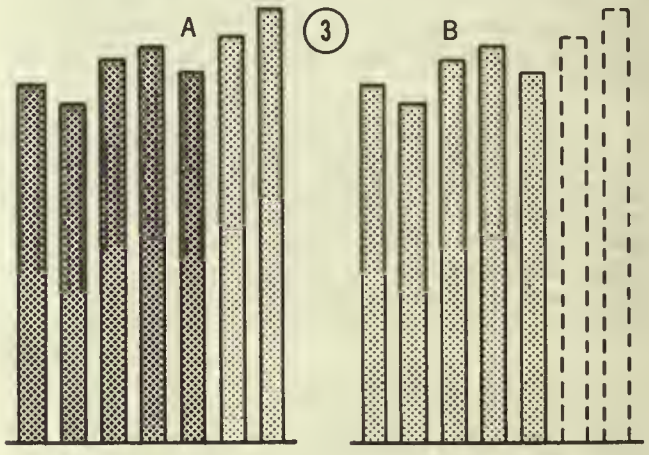
The same considerations apply to projections on surface charts: the ghost method is a good one when it works; but mechanical problems are often such an obstacle that the signpost method is a better choice. The more components there are (and therefore the more different shading patterns) the more difficult it is to find matching dark and light shadings for each pair of actual and estimated pieces.

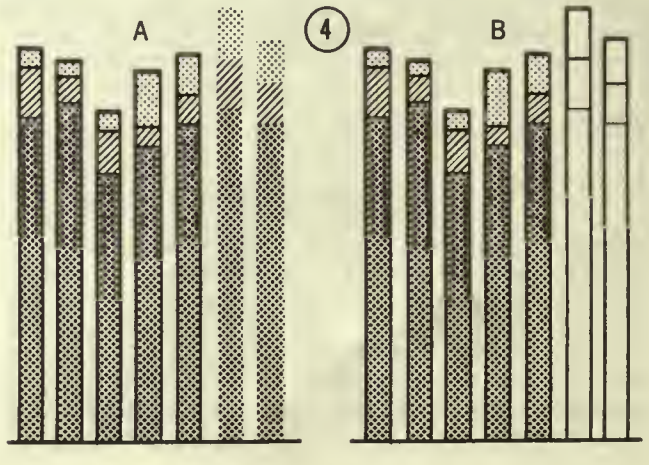
Chart 3 illustrates two methods of showing projected data in a column chart. Both are effective: A is better for suggesting estimated or preliminary data, B for genuine projections. Chart 4A shows still another way to suggest the difference between actual and projected. In this method there is no need for lighter shadings, a troublesome problem when the columns are subdivided. 4B is a treatment similar to 3B. It works well only when the trend in each layer of divisions is fairly steady. (See also "Split-Scale Combination," page 59.)

Of course the signpost method used in Charts 1 and 2 can be used for column charts



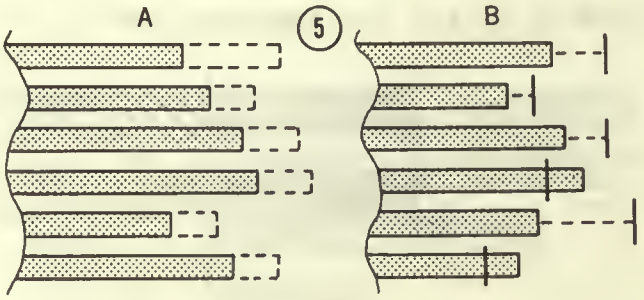


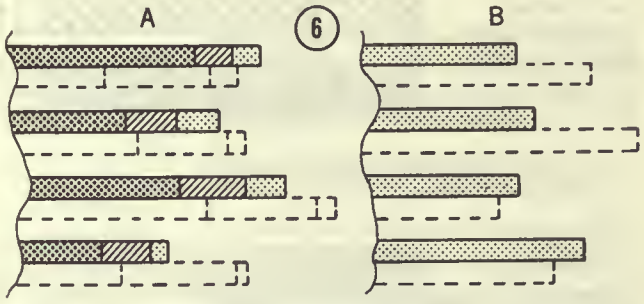




also. In fact this treatment is recommended for column charts when they are presented with curve or surface charts that use it.

Chart 5 shows two ways to add projected data on a bar chart. Method A is better because its meaning is clearer; but it can be used only when the projected data are all larger than the current amounts. When some of the future data are smaller, method B must be used. The grouped-bar arrangement used in Chart 6A is the standard way to show projected data for subdivided bars. It works equally well for simple bars (6B), but uses twice as much space as methods 5A or B.





Successive Projections

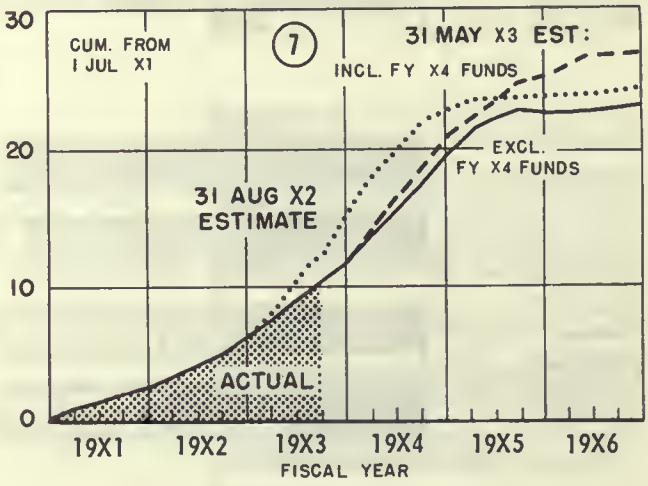
A series of forecasts made at different times may present special difficulties. This problem occurs most often in time series charts, but can appear in bar charts also (see page 71).

The standard method of showing successive forecasts on a curve chart is to change the curve design for each forecast, as in Chart 7 on this page. It is important to choose patterns that will suggest which forecast was made first, which second, etc. (especially if they cross). EXCEPTION: If the projected curves are so well separated that there is no chance of confusing them, the same pattern can be used for all.

Labeling is often the hardest part of showing several projections. Be sure to:

1. Keep labels as simple as possible.
2. Try to arrange them in the order in which the estimates were made.
3. Group any related labels (see Chart 7).

If direct labeling does more to confuse the chart than to clarify it, use a key. But be sure to use a distinctive pattern for each projection.



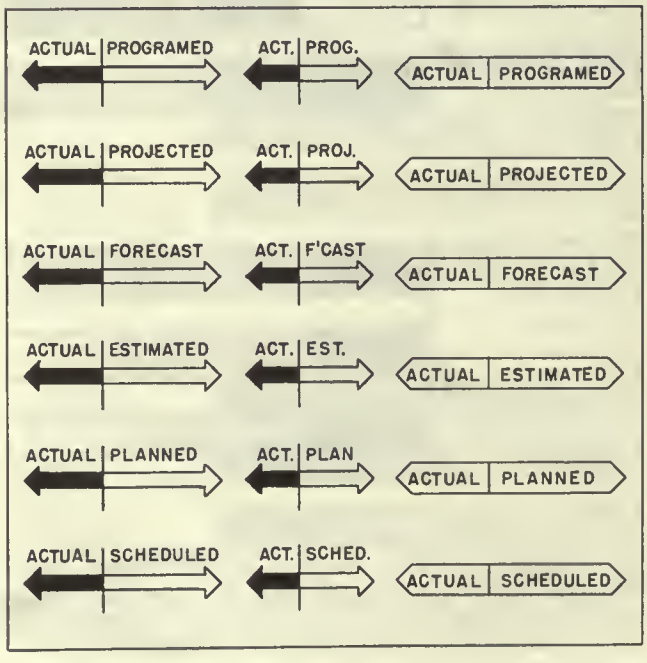
Actual-Estimated Arrows

There are several methods of labeling actual and future parts of the chart, but the two-way pointer used in this manual* is about as clear and foolproof as any. It shows at once that some of the data are not actual results, it shows where the actual data end, and it is flexible enough to meet most needs.

The illustration opposite shows a useful assortment of past-and-future labels. The style at the left is considered preferable (the abbreviated forms on the middle are useful when space is tight). The alternative method shown at the right, with lettering inside the pointers, is somewhat simpler but less flexible in use.

Two hints for using this device:

1. When the latest "actual" point is so close to either end of the chart that spelled-out labels won't fit, use the abbreviated form.
2. When there are only one or two months of actual data, omit the "actual" half of the arrow and its label; when there are only one or two months of projected data, omit the "future" half.



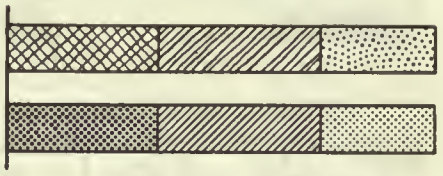
* See pages 92 and 106.

HOW TO SELECT AND USE SHADING

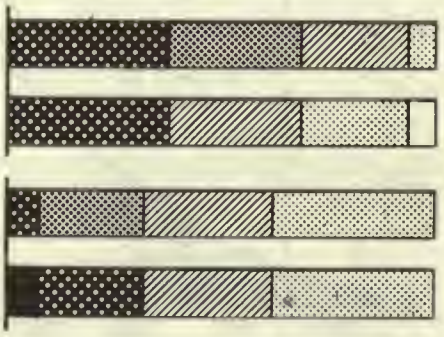
Shadings look best when all are about the same "coarseness".

Very coarse or unusual patterns are hard to look at and distort the bar.

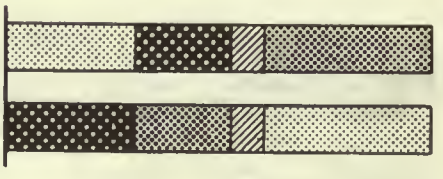
Even-spaced patterns are better for charts than irregular patterns.



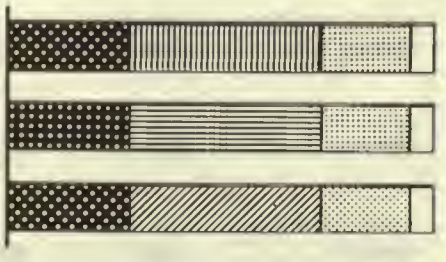
White and/or black can be used for very small segments. They help to get better contrast between other shadings. (See also examples on pages 52-53.



The standard order of tones is dark to light. (See text for exceptions).



The patterns should be placed at a 45° angle. Vertical or horizontal designs distort the area shaded. a/



a/ Vertical shading on bars or horizontal shadings on columns have another disadvantage: in small segments they are confusing because they look like two or three smaller divisions.

SHADING

The kind of shading used and the way it is used is exceedingly important. In fact, an otherwise good chart may be ruined by poor shading.

Selecting Shading Patterns

Shading patterns should not be so coarse that they disturb the eye or distort the areas they shade, nor so fine that they fill in when reproduced. It is sometimes hard to stay between these extremes; but it can be done much more often than it generally is.

If patterns are too coarse, they are too noticeable. Shading should serve its purpose quietly and efficiently without calling itself to the reader's attention. Patterns that are to be reduced considerably in reproduction should be coarse enough to stand the reduction, but peppermint-stick or checkerboard patterns are seldom justified.

Different patterns in any one chart (or in a series of charts presented together) should be about the same coarseness. If one pattern is coarse and the next fine, the coarse one seems closer to the eye and it breaks up the unity of the chart. This sort of contrast has about the same effect - and the same lack of logic - as outlining one bar with a thin line and the next with a thick line.

Shading Arrangement

The safest scheme is to put the strongest tone next to the base line, the weakest the farthest away. Sometimes this arrangement can be changed to good advantage, but it is the best general scheme to follow.

Sometimes - especially when several shading patterns are used - there is a temptation to alternate the tones: first light then dark then light then dark. However, this should be avoided as much as possible because it breaks up the unity of the chart and makes it hard to look at.

Shading for Sense

Sometimes the logical order of the data does not put the most important part close to the base line. For example, in comparing how the cost of two items is divided into materials, manufacturing, and distribution, the main interest might be in manufacturing cost. Shading these components in the standard way would put the emphasis in the wrong place.

Sometimes the nature of the data leaves no choice of how to shade the chart. For example, a chart divided to show the number of cloudy days and sunny days would look more sensible if a darker shading were used for "cloudy," a lighter shading for "sunny." In the same way, data divided into such categories as white and non-white, blacktop and concrete, would make more sense if shaded according to the nature of the subject.

These examples point up the rule that the choice of shadings should always be thought through, and not left to whim or habit. Although the answer is seldom as obvious as in these illustrations, most charts can usually be worked out so that the shading helps to tell the story instead of hiding it.

Using Black and White Shadings

Although black and white are not recommended for standard use, sometimes both can be used to very good advantage. Black is easy to add to the chart, white requires no work at all; and since the chart designer often needs more tone steps than he can get with shading patterns, these two extremes are frequently useful.

White is usually a poor tone (on white paper) because it does not set off the shaded part from the background. It is never effective for large areas; but it is sometimes good for small ones if the outline of the bar or column is heavy enough to set it off from the background. In fact, for very small segments, white is often better than a shading pattern because it is less likely to fill in and be lost in reproduction.

Black is good for small segments but poor for large ones. Black is so strong that it can very easily dominate the chart if it is not used with restraint. However, as shown in the accompanying illustrations, it can help to simplify many shading problems and to make the chart easier to understand.

Shading Problems

Double or triple bars usually should have the strongest shading in the top bar because this usually shows the most recent or most important data. If a double bar consists of an actual result and a program or forecast, use the stronger shading for the accomplished fact.

Double or triple columns should follow the same shading principles used for grouped bars.

Overlapping bars or columns should always have the stronger shading: the overlapped data should be lighter (see page 91).

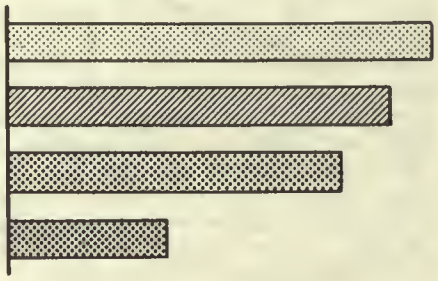
When subdivided bars, columns, or surfaces change from actual data to forecast, program, etc., avoid two sets of shadings unless they match in pattern and gradation (see pages 92-93).

When shading is added to a time series surface chart to bring it up to date, remove the shading back to the nearest vertical grid line, then apply a new area wide enough to include the current data.

SUGGESTED SHADINGS

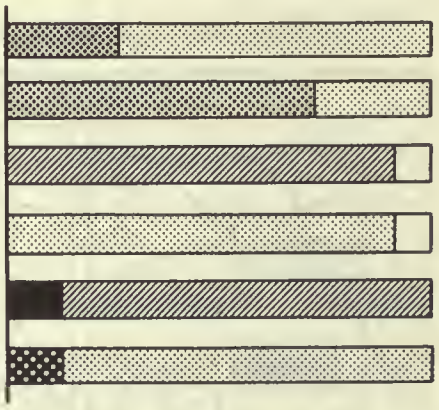
1 Shading

Charts with mostly long bars need a lighter tone than those with mostly short ones.



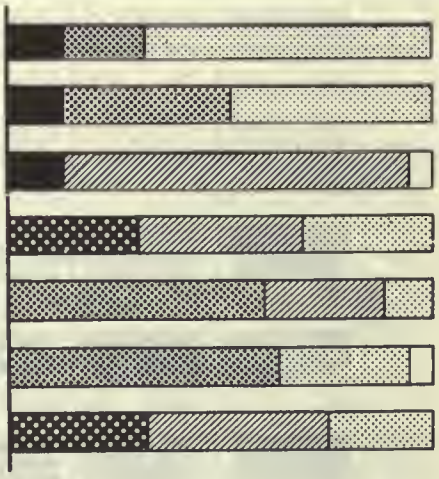
2 Shadings

The same rule applies to parts of bars also. (Use black or white only for very small divisions.)



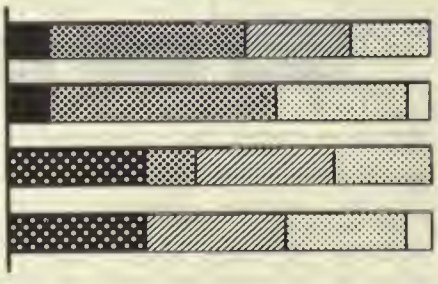
3 Shadings

Note that different combinations are used for different distributions of parts within the total. (See text.)



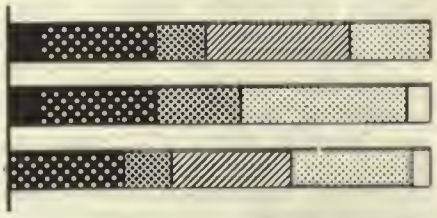
4 Shadings

The same principles apply when shading four segments.



5 Shadings

About the limit (unless color can be used).



Note: For the pattern numbers and other information about these shadings, see page 96.

Shading Patterns for Different Reductions

Many shading patterns, printed on transparent film with a dry adhesive backing, are available commercially. The four series of shadings illustrated below should meet most chart needs. The patterns listed in the left column are for charts requiring only a little reduction. This list includes the shadings used for most of the illustrations in this manual. The second and third lists are for charts planned to take a moderate to heavy reduction. The fourth series is for large display charts that are planned for reduction to letter size.

SHADINGS FOR DIFFERENT REDUCTIONS a/

Tone	For Reductions of:			
	Up to 1/3 b/	1/3 - 1/2 b/	1/2 - 2/3 b/	2/3 - 4/5
1	c/ 83	3 84	c/ 87	c/ 93
2	c/ 501	T-B 502	000 d/	c/ 269
3	F-6 258	36 266	79 268	83 92
4	c/ 32	22 305	62 306	c/ 407
5	59 67	c/ 205	56 95	97 208
6	c/ 303	24-R 304	25-R 307	27-R 209
7	38-R 104	56-R 107	29-R 106	61-R d/
8	7-R d/	7-R d/	7-R d/	7-R d/

a/ Figures under each sample are manufacturers' pattern numbers. Numbers at the left are ZIP-A-TONE numbers, those at the right are CRAF-TONE numbers. (A third brand - ADD-A-TINT - is available in the same patterns as ZIP-A-TONE.) Patterns including the letter R are printed in red (which reproduces black). The red is transparent, and so enables the draftsman to see the bar or surface outline the shading must be cut to fit. The original samples have been reduced 16 percent in this manual.

b/ These patterns will stand up under a greater reduction than the top limits suggested, but only when reproduced with extreme care on a good quality paper.

c/ Not available in ZIP-A-TONE.

d/ Not available in CRAF-TONE.

Notice that in each series all the patterns have about the same coarseness. Two reasons for this are that: (1) a shading that is coarser than that for the remainder of the chart is hard to look at and distorts the chart, and (2) a shading that is too fine for the reduction used will look "muddy" after reproduction.

NOTE: Eight patterns are included in each series to provide a wide selection. This does not mean that all eight should be used on the same chart; in fact some of these patterns are merely alternatives that produce about the same effect.

In many charts, more contrast is needed than is provided by these successive steps. When no more than four shadings are required, good contrast is provided by using alternate patterns.

Some of the patterns in the fourth series are not quite as coarse as they should be for a 4/5's reduction. However, they are the coarsest patterns available. (The section on "Shading Displays" in the Display Presentation chapter suggests some other methods for making the large displays.)

Sometimes it is necessary to use a pattern from the next coarser series, to provide a clear distinction between several patterns on the same chart; but this should be done only when unavoidable. Mixing up coarse and fine patterns "breaks up" the chart (see "Selecting Shading Patterns," page 94).

Whenever there is any question about the quality of reproduction, choose a shading series that will be sure to reproduce clearly. It is better to use patterns that look a little coarse, but are easy to distinguish, than to use finer patterns that fill in. However, coarse patterns are undesirable on a small chart or on any chart that is viewed from close up. Do not use patterns that are coarser than are actually needed to show a difference between one pattern and another.

SUBSTITUTE SHADINGS a/

Tone	For Reductions of:							
	Up to 1/3		1/3 - 1/2		1/2 - 2/3		2/3 - 4/5	
	Zip	Craf	Zip	Craf	Zip	Craf	Zip	Craf
1	87	75	4	85	33	81	83A	-
2	-	-	-	-	-	814	97	208
3	01	255	-	265	-	207	61	97
4	85	61	X	302	-	-	-	-
5	9	33	54	261	29	94	-	269
6	-	301	-	-	-	-	20-R	-
7	-	103	-	-	NH-1	-	NH-5	109
8	Any satisfactory method of getting black.							

a/ These are similar to the suggested patterns shown in the table at the left, and may be substituted with reasonably good results. Pattern numbers at the left are ZIP-A-TONE; those at the right, CRAF-TONE.

SELECTING CURVE PATTERNS

Curve design, like shading, should be carefully thought out. A thoughtful choice of curve pattern and weight can make the chart easier to understand and can help bring out the facts the reader should learn.

It is not necessary to use a different design for each curve in a chart. The only times when different patterns are needed are: (a) when curves cross; (b) when the nature of the data demands it.

In most charts each curve does not cross other curves and one pattern can be used for more than one curve without any chance of confusion (Chart 1). When curves do cross, it is not always necessary to use different curve patterns. Varying the weight will often work just as well (Chart 2).

Sometimes the nature of the data suggests the design of the curve; sometimes it practically dictates it. Broken-line curves, for example, are appropriate for showing estimates, projections, averages (when compared with the unaveraged data), and schedules or programs. Either dot or dash lines may be used for these purposes. (See pages 92-93.)

It is desirable to avoid a different pattern for every curve because:

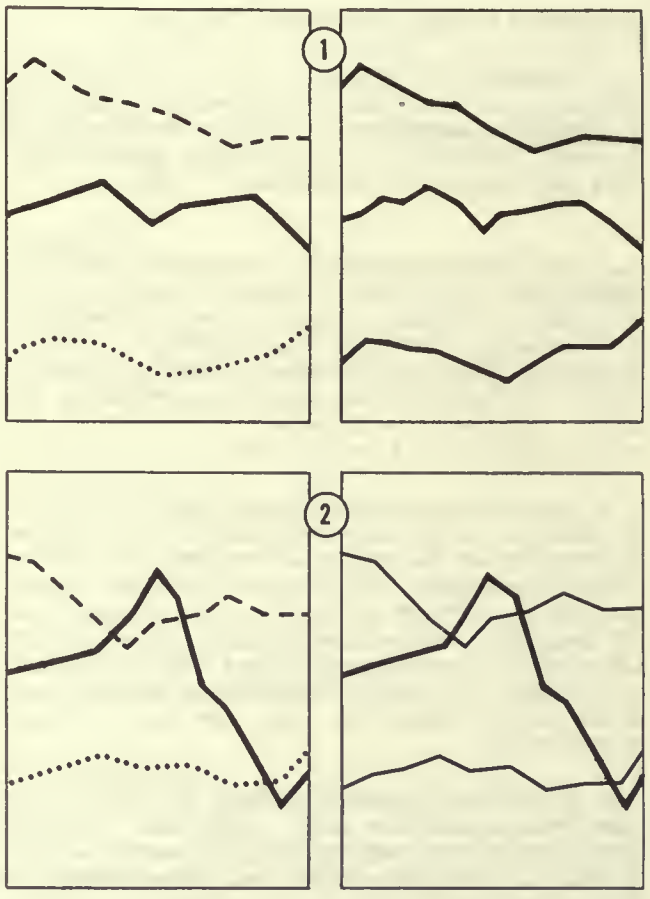
1. Only two or three patterns are easy to draw. Except for the continuous or solid-line pattern - all patterns are time-consuming and hard to draw uniformly.*
2. Changes in pattern automatically change the emphasis; and there is no simple way to control these differences in emphasis.

In selecting curve patterns, make important curves prominent and less important ones less prominent. When the emphasis on all the curves is the same, make dot or dash curves slightly heavier than solid curves so that they will appear to be the same weight.

The following recommended patterns will meet most needs:

Solid line - for a single curve and for any other purpose it can be made to serve.

Dash line - for showing projection of a solid line curve, averages, upper limits (such as ceilings or quotas), lower limits (such as minimum requirements), and in general for all "ghost" curves (such as curves showing how the data would look if certain adjustments had not been made, or how it might look if certain changes were made.) Also, a dash line curve is a good second choice when a solid line curve cannot be used.



Dot curve - for all the uses listed above for dash curves, especially when a dash pattern must be used for one of the main curves on the chart. Dot curves are good for showing revised estimates or for projections (when original estimates are shown by a dash-line curve).

Dot dash curve - sometimes necessary when a fourth pattern is needed. Easily confused with a dash curve unless carefully drawn.

Ball and line curve - for data plotted at irregular intervals or when it is important to emphasize the plotted points. (For example, when data are plotted in the spaces between vertical rulings.) This works best when the plottings are not too close together.

Circle and line curve - as a secondary curve to accompany the ball and line pattern. This also can be used for estimates, projections, etc., by making connecting lines dashed instead of solid.

STANDARD PATTERNS

———	Solid	The basic three: will meet most charting needs.
- - - - - -	Dash	
.....	Dot	
—·—·—·—	Dot Dash	Additional patterns for special problems. See text.
●——●——●	Ball & Line	
o——o——o	Circle & Line	

These patterns, in varying weights when necessary, are the recommended standards for statistical charts.

* "Prepared" curves (preprinted on a transparent adhesive film) are available in a wide range of dot patterns and some dash patterns. They provide more uniform results than most draftsmen can draw and are excellent when they can be used. They are best on large simple charts; for a small chart or for many close plottings this method is extremely tedious.

PREPRINTED PARTS IN CHART CONSTRUCTION

Preprinted materials are not entirely effective for making charts because they can seldom be rigidly standardized. Such materials should be used, however, when they will speed up the work and improve the appearance of charts.

It is often possible to preprint component parts such as labels, titles, time scales, or any other elements that are used repeatedly. For example, chart or page headings (such as Training, Military Personnel, Health, Safety, etc.) used month after month in a recurring report, might well be prepared in quantity in advance and then used as required.

When the same layout can be used for several charts, it is sometimes profitable to reproduce copies of the entire chart framework in advance (including lettering and any other component parts that are common to all charts). Even plotted data can be preprinted: for example, the average for a group of installations could be included on reproduced skeleton charts that would each be filled in with the data for one installation.

In addition to "tailor-made" parts, several commercial materials are useful as prepared parts for chart construction. Some of the most useful of these are "type" and "tone" sheets of thin transparent film with a pressure-adhesive backing. 1/

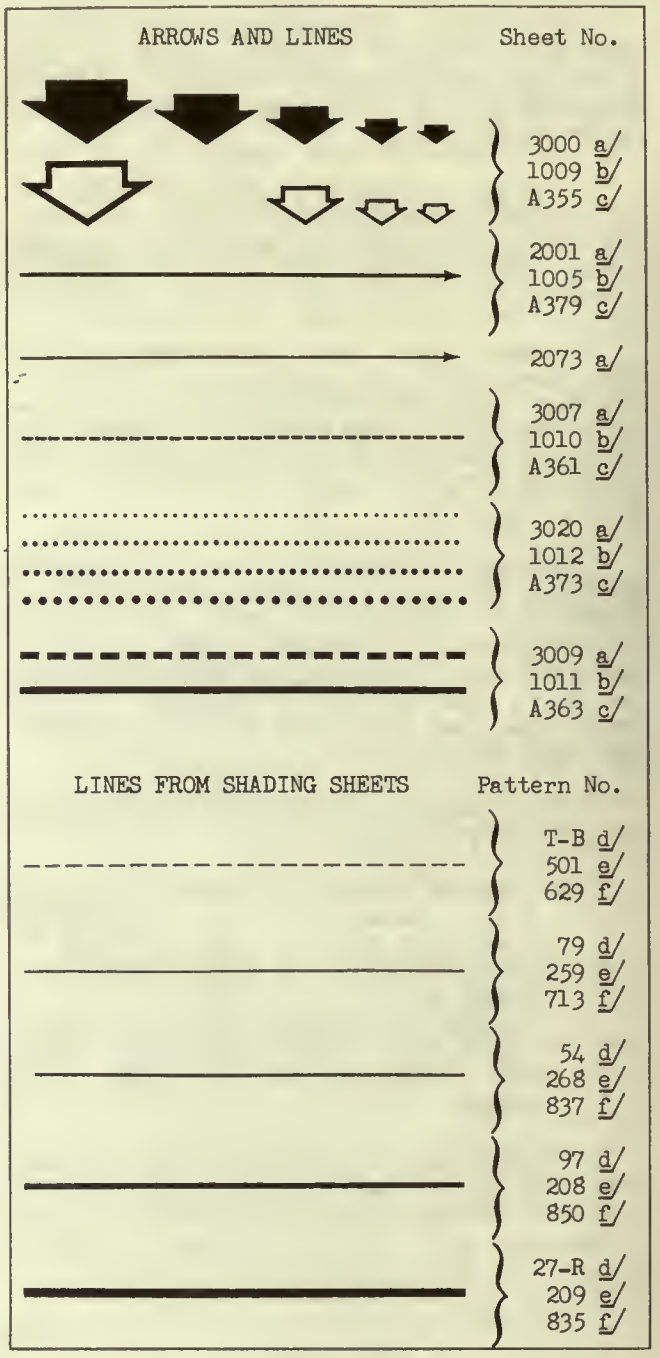
"Type" sheets (for example, ADD-A-TYPE, ARTYPE, CRAF-TYPE) contain alphabets, numbers and letters in series, arrows, asterisks, and other useful graphic devices. The illustration at the right shows some of the items available on these sheets. The two most useful for ordinary charting are the long arrows (used as label pointers) and the broken lines (used for curves and other chart lines).

This cut-and-press-on method is not always practical for chart curves. A curve with a great many close plottings would require so many small patches that it would be more trouble to put on than an ordinary pen-and-ink curve. Also there are times when the chart needs a different weight curve than these preprinted lines provide. However, they are worth remembering: often they can help to cut production time; and like all preprinted parts, can help the draftsman to turn out a better looking chart. In addition, they help to get uniformity throughout a series of charts drawn by several draftsmen.

The lines in the lower part of the illustration were cut from shading "tone" sheets (ZIP-A-TONE, CRAF-TONE, ADD-A-TINT). 2/ Some of these lines fit charting needs very well. However, the chore of slicing one line from a shading pattern and putting this on the chart is difficult unless the pattern is coarse enough to provide a fairly wide strip.

1/ This is a dry wax adhesive. Sheets must be burnished down to adhere evenly and firmly.
2/ Examples of shading patterns are shown on pages 94-96.

USEFUL "STICK-ON" PARTS



a/ ARTYPE (Artype, Inc.)
b/ CRAF-TYPE (Craftint Mfg. Co.)
c/ ADD-A-TYPE (Arthur H. Brown & Co.)
d/ ZIP-A-TONE (Para-tone, Inc.)
e/ CRAF-TONE (Craftint Mfg. Co.)
f/ ADD-A-TINT (Arthur H. Brown & Co.)

The two-way arrows shown at the bottom of page 93 are excellent subjects for preprinting. They are such a nuisance to draw that a ready supply of them is a time-saver as well as a convenience. These devices can easily be made by offset reproduction. They can then be pasted on with rubber cement or two-sided adhesive tape.

Security labels can also be reproduced and stocked for future use. These are also obtainable through regular supply channels, in three sizes, on transparent film sheets (ARTYPE No. 3031).

CHART CAPTIONS

Chart captions are titles, subtitles, general notes, and any other words that apply to the chart as a whole. Most captions - especially titles - tend to be too long. They should be long enough to be clear and accurate; but clarity and accuracy are not necessarily gained by using more words. Good captions are the result of choosing the right words and arranging them properly.

Titles

The main title should give the reader a quick, clear understanding of the content of the chart. The title (and in fact every caption on the chart - but especially the title) should be written as much as possible from the reader's point of view. The words should be as simple as possible and the concepts behind these converted into familiar ideas.

Location. A title is normally centered above the chart grid, but individual titles may be placed inside the grids when several related charts are covered by a single main title.

Length. One-line titles are usually best; two lines are sometimes needed, but never three. One way to keep main titles short is to put secondary information in a subtitle. For example, the title:

OFFICER, ENLISTED AND CIVILIAN OPERATING PERSONNEL IN WASHINGTON, D.C. METROPOLITAN AREA

can be rearranged:

OFFICER, ENLISTED AND CIVILIAN OPERATING PERSONNEL
In Washington, D.C. Metropolitan Area

Many titles are too long because they contain information that belongs somewhere else in the chart. The title above is a good example of this. If "officer," "enlisted" and "civilian" appear on the chart as labels, the title should be cut to eliminate these words.

Avoid the poor practices of merely repeating labels in the title or of cataloguing every detail of the chart in a subtitle. This is an example of the second fault:

ARMY CIVILIAN PERSONNEL
Actual Strength, Ceilings, Projections
19X1-X5 by Months

When long titles must be broken into two lines, break them for sense: at a logical break in their meaning. For example:

Use: DECORATIONS AND AWARDS
TO U.S. ARMY PERSONNEL

Or: DECORATIONS AND AWARDS TO
U.S. ARMY PERSONNEL

But not: DECORATIONS AND AWARDS TO U.S.
ARMY PERSONNEL

If a title can be broken in two places, use the one that will avoid two exactly equal lines or one very long and one very short line.

Abbreviations should be avoided in titles as a general rule. EXCEPTION: When a term is repeated in a series of chart titles, abbreviate not only to keep the titles short, but also to help the reader see the difference between titles more quickly.

Subtitles

A subtitle is a secondary caption that explains or qualifies the main title. Subtitles may be used for such items as date (see page 86), index base period, and limits of coverage. They are usually placed beneath the title, but may be put within the grid.

General Notes

A general note applies to the chart as a whole. If it should be seen before the chart is read, it is put at the top of the chart (between the title and the grid); if it is very long, or not important enough to need first attention, it is put at the bottom of the chart, aligned at the left side. A general note is generally preceded by the word "NOTE:".

Reference Notes

These are special explanations about a portion of the chart or data. In general they should be used only when the reader needs them to understand the chart properly.

A reference note is normally put at the bottom of the chart directly below a general note if there is one. It is sometimes possible to put a short reference note directly at the point it refers to (for example, a dip in production might be labeled with the word "strike").

Reference notes are put one under the other in order of their references in the chart. When they are very short, or when space is limited, several notes may be put one after the other.

Every reference note starts with a reference mark matching the mark shown at the point of reference. When only one mark is needed the asterisk (*) is the standard. When more than one reference mark is needed, use lower case letters set off by an underscore and slant (a/, b/, c/, etc.).

For an example of how reference notes are handled, see the upper chart on page 45.

Source Notes

These are captions that tell either the source of the data or the source of the chart or both. Charts in reports do not need to note the chart source except on charts prepared by a different office than the one responsible for the report.

The source of the data should be noted whenever the reader needs to know which of several likely sources the data came from or when the publisher of the report does not assume responsibility for the data. Source notes appear below all other notes (if any) at the left side of the chart, preceded by the word "SOURCE."

LABELS

When there is only one curve or one set of simple bars or columns, the title and other chart captions usually provide all the information needed. But when the chart carries more than this, more identification is needed. Such a chart can be clearly understood only if the graphic parts of it are labeled carefully and completely.

Direct labeling is almost always preferable to a key or legend because it provides the quickest and most accurate understanding of a chart.

Location. A label should be close to the thing it labels but not quite touching it. A good rule of thumb is to place the label about 1/2 to 3/4 the letter height away.

Do not scatter the labels all over the chart: try to arrange them in an orderly way.

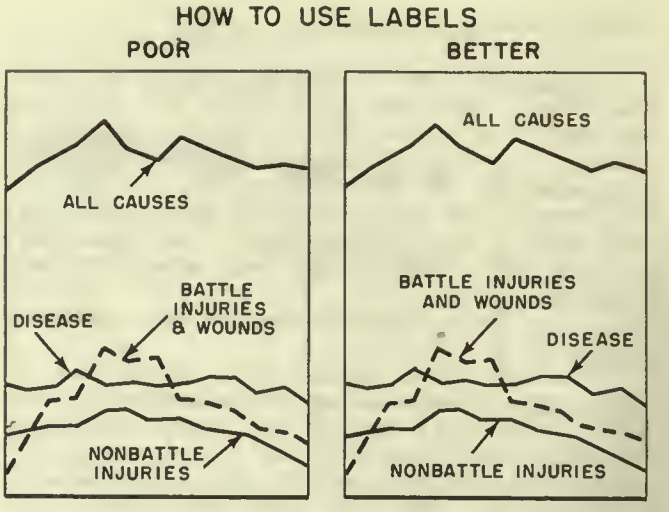
Do not put labels directly opposite the ends of bars: place them either above or below. Do not put labels on a slant. Do not zig-zag them to follow the shape of the curve.

NOTE: Sometimes several label arrangements should be tried in order to find the best one. For all but the simplest charts, make labels as separate pieces that can be moved.

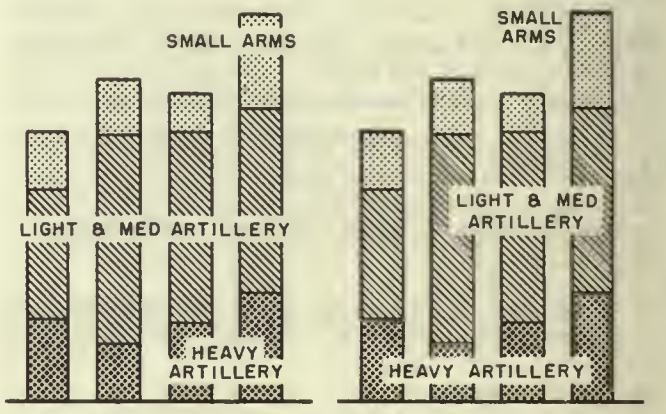
Do not trim labels too close: leave a margin of white space around the outside (about 1/2 the height of the letters - no less than 1/20").

"Pointers." If the label cannot be put near enough to show clearly what it relates to, it can be placed well away and connected by a "pointer." The standard pointer is a straight line with a small arrowhead (see page 98).

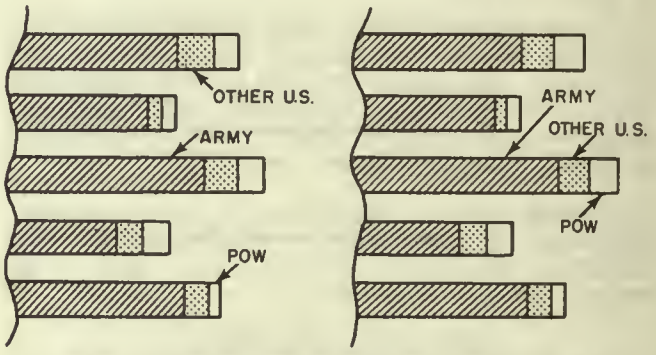
Keys. Legends and keys formerly were widely used in statistical charts but they generally should be avoided except for series of charts that use exactly the same labels. Unless keys can be memorized easily, they waste the reader's time and they are likely to cause confusion. If used at all, it is best to put the graphic samples first, then the explanations.



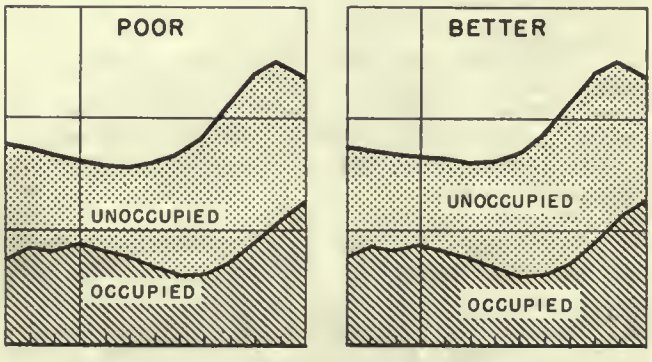
Place labels to read in order: avoid having arrows point in too many different directions.



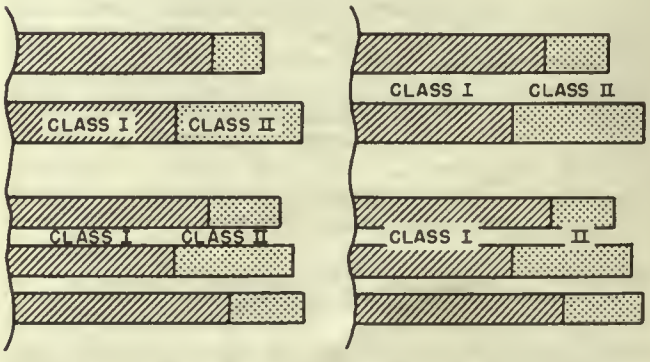
Keep labels all inside or all outside the parts they label: otherwise they cut up the chart.



Relate all labels to a single bar, and if possible arrange them in the proper order.



Leave a margin of white space around labels: do not put them too close to rulings.



Avoid putting labels inside bars: put them above or below; if too crowded, overlap slightly.

ARROWS AND OTHER LABEL POINTERS

If labels are placed carefully and put close to the thing they label, there is usually no question about which label relates to what. But sometimes the most careful placement still leaves the reader in doubt. In such cases some sort of pointing device is necessary.

Although it may seem like a minor matter, the kind of pointing device used and the way it is put to use can have an important effect on the clarity of the chart.

The purpose of a pointer is simply to point to something. This can be done with a fairly light, simple line with an arrowhead. Fancy or overweight devices are more trouble to make and distract the reader's attention from the thing they point to.

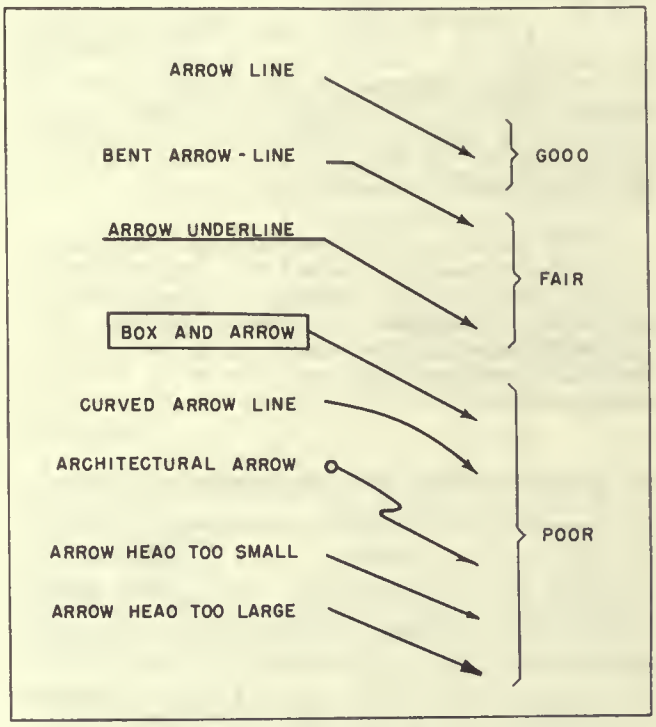
Hints that will help to place pointing devices effectively follow:

1. Try to put pointers where they will not cross a curve or some other part of the chart to which they relate.
2. Use straight lines. Curved or bent lines add one more unnecessary flourish and take longer to draw.
3. Make the lines long enough to see. If the space is just barely big enough to take an arrowhead, a pointer is not needed.
4. Draw the line at a sharp angle (45° is good), preferably in the direction opposite the curve. Vertical or horizontal pointers do not stand out from the grid lines.
5. When more than one pointer is needed, draw them at the same angle and, if possible, in the same direction (see page 100).
6. Do not make the line thicker than the lettering to which it relates - thinner is better.
7. Do not make arrowheads too big: a long one is better than a short, fat one.*

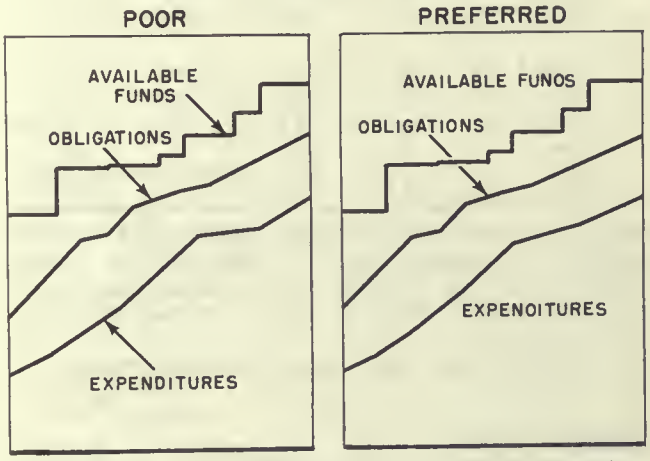
NOTE: Several manufacturers make arrows on transparent press-on film. The ones used in this manual are ARTYPE, Design # 2073 (see page 98).

* However, attention arrows (the short, squat kind that are all head and no body) are excellent for marking an important spot on the chart, such as the location of V-J Day or D Day, or some level such as a year-end objective.

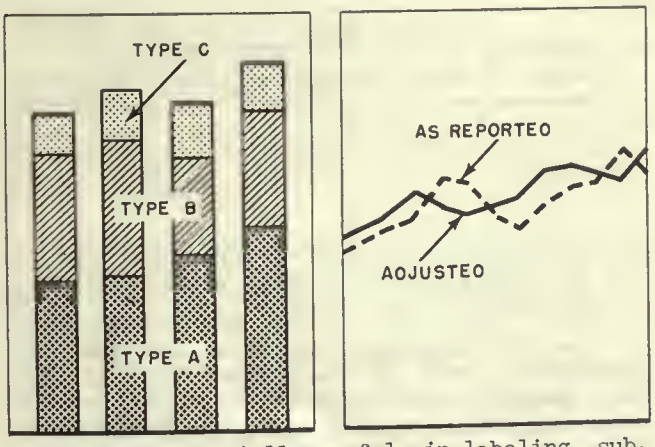
POINTING DEVICES FOR LABELS



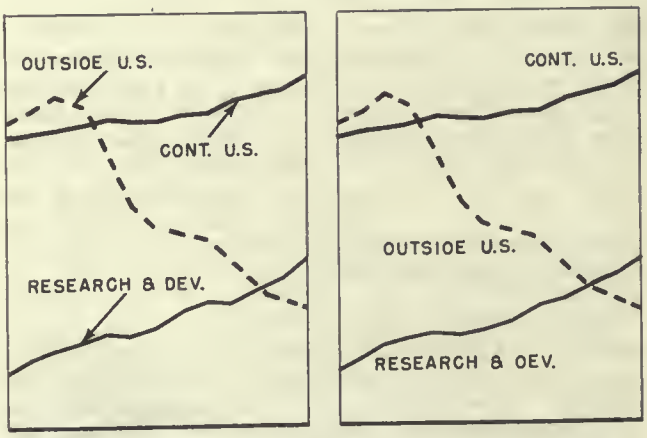
WHEN TO USE ARROWS



Use arrows when curves are crowded or when labels are too long to fit close to curves, but do not use more than you actually need.



Arrows are especially useful in labeling subdivided columns or "interlocked" curves.



Sometimes another arrangement of the labels will remove the need for any pointers.

CHART LETTERING

The aim in lettering statistical charts is to use lettering that is easy to read yet does not overpower the rest of the chart. When the charts are used in statistical reports, extra care must be taken to avoid the extremes of lettering that is too big or bold for the text matter or too small or weak to be legible.*

The lettering used throughout this manual is the recommended standard for report charts. It is a single stroke "gothic" (block) letter made with "mechanical" lettering guides. The standard lettering sizes made with these guides and the appropriate pens are listed in the following table.

LETTERING GUIDES AND RECOMMENDED PEN SIZES

Letter Height a/ (Capitals)	LEROY		WRICO b/	
	Pen Number	Line Weight	Pen Number	Line Weight
.080"	00	.013"	13	.013"
.100	0	.017	17	.017
.120	0	.017	17	.017
.140	1	.021	21	.021
.175	2	.026	26	.026
.200	2	.026	26	.026
.240	3	.035	35	.035
.290	4	.043	43	.043
.350	4	.043	43	.043
.425	5	.055	55	.055
.500	6	.067	67	.067

NOTE: Letters larger than .500 ($\frac{1}{2}$") are not needed for report charts. For table of larger guide sizes, see Display Presentation chapter.
a/ Guides are referred to as number 80, 100, 120, 140, etc.
b/ Scriber type; also made in stencil type.

Standard Sizes

The table at the upper right tells what size guide to use for each lettered part of the chart. Note that except for two items the sizes are one step larger for full-page-wide charts than for half-page-wide charts.

These sizes are recommended for report charts to be reproduced same size or to be reduced no more than 20 percent in reproduction (this manual was reduced 16 percent). As a rough rule of thumb, increase these sizes one step (on the original chart) for each additional 15 percent reduction. For example, in a half-page-wide chart drawn for a 35 percent reduction, make the title size 140 instead of 120; for a 50 percent reduction, make the title 175.

* When making displays such as large wall charts, easel charts, or charts for projection, the major problem is to get the lettering big enough. For displays, the lettering should be larger and heavier - in relation to the rest of the chart - than for charts in printed reports (see Display Presentation chapter).

NOTE: The sizes specified in this table were selected for charts to be used with elite typewritten text or tabular data. However, they are equally effective for charts that appear on report size sheets without text or tables.

LETTERING SIZES FOR STATISTICAL REPORT CHARTS

Chart Component	Chart Width	
	Half Page	Full Page a/
Chart Number b/	.080"	.080"
Main Title	.120	.140
Subtitle c/	.100	.120
Amount Scale		
Captions d/	.080	.100
Numerals	.100	.120
Time Scale		
Months or years only e/ .	.100	.120
Months with years e/ . .	.080	.100
Years with months	.100	.120
Time captions d/	.080	.100
Labels f/	.080	.100
Bar Charts		
Stub headings	.080	.100
Stub items c/	.100	.120
Footnote	.080	.080

a/ For charts one-third of a page or more high.
b/ If used.
c/ Use one size smaller if captions are long and cannot be abbreviated.
d/ Make one size larger if used as subtitle.
e/ Use same size for quarterly designations.
f/ Use one size larger for short labels such as WW II, V-J DAY.

Letter Count for Chart Titles and Notes

The tabulation below gives the average number of CAPITAL letters that will fit in one line without crowding. This is useful for estimating how many words will fit on a line, and for helping to judge whether long titles and other captions need to be shortened.

Guide Size	Average Number of Letters per:		
	Inch	Chart Width a/	
		Half Page	Full Page
80	12+	50	104
100	10	40	83
120	8+	33	68
140	7+	29	60

a/ Based on width of chart originals for this manual: 4" and 8.3".

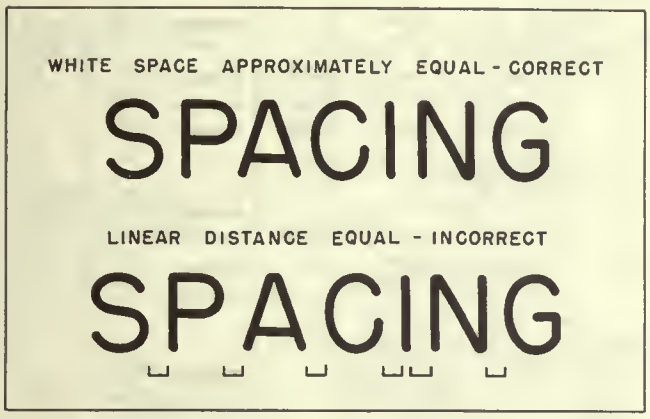
A space between words should be counted as one letter; but if the letter count is high, word spacing can be squeezed slightly. Captions with several letter I's or figure 1's will take less space than indicated; those with a large number of M's and W's will take more.

Spacing Lettering

Good lettering requires good spacing. Poorly spaced lettering not only looks careless but is hard to read. Lettering guides are a great help in drawing even, uniform letters; but they are no help in spacing. Spacing is a matter of eye judgment, not mechanical measurement.

Letter Spacing

The nearest approach to a rule for spacing letters is to make the AREA between them roughly equal. Equal LINEAR distances will not produce good lettering.



In spacing letters, the amount of space inside the letters should be considered. For example, two O's must be spaced closer together than two N's.

A safe rule for making lettering readable is to use about 1/4 to 1/3 the letter height as the normal space between letters:

1. Put this normal space between all parallel-sided combinations (AV, HE, NE, WA, MP, etc.);
2. Put round letters (like O, C. Q and G) and overlapping combinations (like LY and TA) a little closer together than parallel-sided combinations;
3. Give the letter I a little more than normal space, because it has no white space within it.

Word Spacing

The space between words should be about 3/4 the letter height (the average letter width). The space between sentences should be half again to twice as much as between words.

Line Spacing

The space between lines should never be less than 3/4 the letter height: more is generally desirable. Never use less space between lines than between words, otherwise the lettering will look like a mass of words instead of a series of lines.

The table at the right shows how much space to use between lines of lettering (or between lettering and grid lines). This spacing is illustrated on pages 105-107. The second column of the table shows the relative distance to use between lines, regardless of the size of the chart or the lettering sizes used. The following four columns show in inches these relative distances as applied to standard-width charts using the lettering sizes recommended in the table on the right side of page 102. Wherever feasible, these measurements have been rounded to permit maximum use of the 10ths and 20ths divisions of a triangular scale.

RECOMMENDED SPACING BETWEEN LINES

In planning these lettered parts:	Use this amount of space from bottom of one line to: Top of next a/ — Relative Distance c/	Top of next a/ — Inches — Half Page Wide	Top of next a/ — Inches — Full Page Wide	Bottom of next b/ — Inches — Half Page Wide	Bottom of next b/ — Inches — Full Page Wide
ALL CHARTS					
Chart No., Title*	1	.13	.14	.25	.28
2-Line Title	3/4	.08	.11	.20	.25
Title, Subtitle*	1	.10	.13	.20	.25
2-Line Subtitle	3/4	.08	.08	.18	.20
2-Line Label	3/4	.07	.08	.15	.18
TIME SERIES CHARTS					
Title*, Grid d/:					
1-Line Scale Cap.	2	.25	.30	--	--
2-Line Scale Cap.	3-1/3	.40	.45	--	--
Subtitle*, Grid d/:					
1-Line Scale Cap.	2-1/2	.25	.30	--	--
2-Line Scale Cap.	4	.40	.45	--	--
2-Line Scale Cap.	3/4	.07	.08	.15	.18
Scale Caption, Grid	1	.08	.10	--	--
Numerals, Grid	1	.10	.10	--	--
Time labels, Grid:					
Months e/ w/years	1	.07	.10	.15	.20
Years w/months e/	2-1/2	.25	.33	.35	.45
Mos. or Yrs. Only	1	.10	.13	.20	.25
Time captions*, Time Labels	1	.07	.10	.15	.20
Footnote*, Time Designations	1-1/2	.12	.15	.20	.25
2-Line Footnote	3/4	.07	.08	.15	.18
BAR CHARTS					
Title or Subtitle, Scale caption*	1-1/2	.12	.15	.20	.25
Scale Caption*, Numerals	1	.08	.10	.18	.22
Numerals, Rulings	1/2	.05	.05	--	--
Stub heading f/	--	--	--	--	--
Stub items, Grid	1	.10	.10	--	--
Footnote, Rulings	1-1/2	.12	.15	.20	.25

* See footnote c/.

a/ Excluding height of letter.

b/ Including height of letter in second line.

c/ Stated in terms of letter height of the item in the stub of this table (the item marked with an asterisk when lettering sizes differ); e.g., make space between chart No. and title the same as the height of title letters.

d/ For column charts, between title or subtitle and top of columns when extending above grid.

e/ Or quarters.

f/ Center opposite scale caption and numerals.

LINE WEIGHT STANDARDS

The table at the right specifies line weights for each graphic part of a chart. These standards are illustrated in the chart-specification sheets shown on the following pages.

Fairly complex charts, such as those showing several series or estimates, or both, may need several line weights. The table lists recommended weights for curve or surface charts that are either a full-page or a half-page wide and weights recommended for column or bar charts.

Many charts, however, have so few components that they do not require all of these weights. Many simple line or surface charts need only three weights: one for the base line, one for the scale lines, and one for the curve line.

These line weight standards are for charts to be reduced up to 20 percent in reproduction.* If the reduction is to be more than 20 percent, increase the line weights as follows:

Line Weights for a 0-20% Reduction	Line Weights for a Reduction of:		
	30%	40%	50%
.010" . . .	.012"	.014"	.017"
.014 . . .	.017	.020	.024
.017 . . .	.020	.024	.029
.021 . . .	.025	.029	.035
.024 . . .	.029	.034	.040
.028 . . .	.034	.039	.047
.030 . . .	.036	.042	.050
.035 . . .	.042	.049	.059
.043 . . .	.052	.060	.072

When charts are to be drawn for a heavy reduction (of 50 percent or less of the original size) avoid using line weights that vary just a little because after reduction there will not be enough difference to tell them apart.

Lettering Pens for Ruling

Leroy and Wrico lettering pens can often be used for line work such as curves, bar and column outlines, and scale rulings. Many draftsmen prefer them to ruling pens, especially when drawing heavy lines. They put a flatter film of ink on the paper, and they provide fixed line weights that avoid the trials and adjustments needed to match lines with a ruling pen.

The table on the left of page 102 shows the nominal line weight - in thousands of an inch - of both Leroy and Wrico lettering pens. The line-weight standards were selected with these pens in mind. Note, for example, that Leroy pen number 0 makes the line weight (.017") recommended for year-end vertical rulings; Wrico pen number 35 makes the line (.035") recommended for single curves; etc.

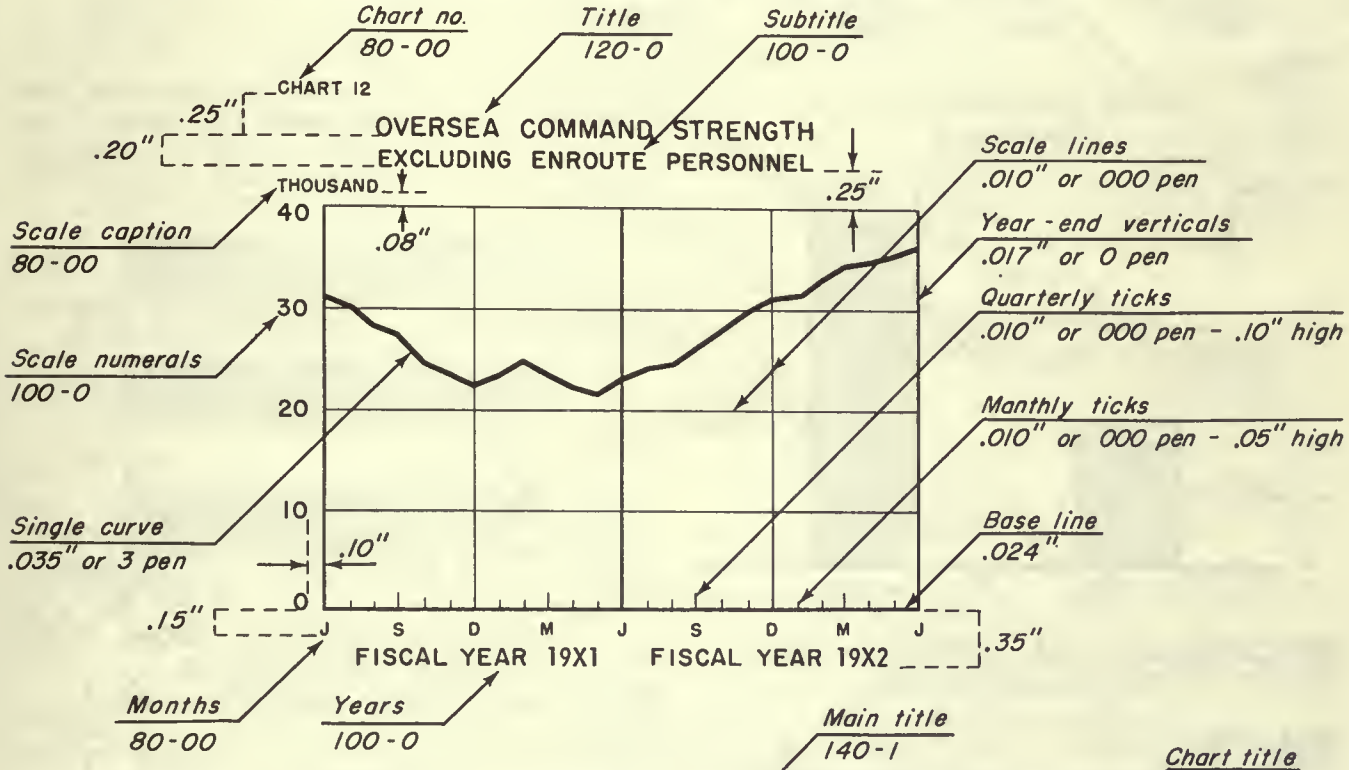
* These specifications assume that accompanying text or tabular material will be reduced the same amount as the charts.

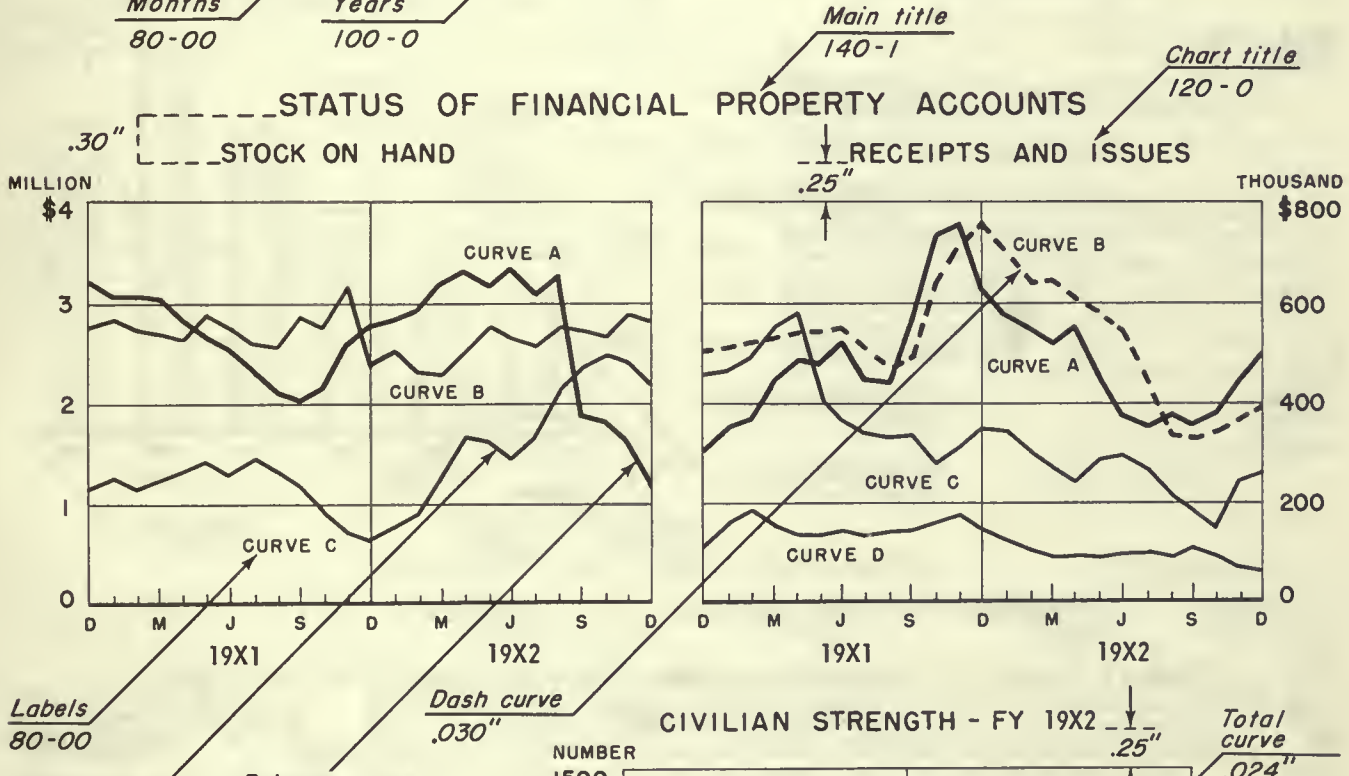
STANDARD LINE WEIGHTS FOR REPORT CHARTS

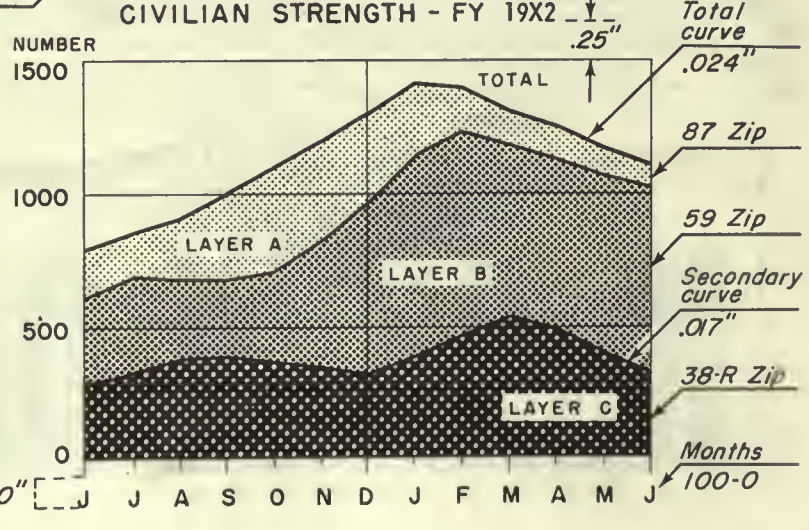
Chart Type and Component	Line Weight a/	Pen Size b/
CURVE AND SURFACE CHARTS		
Half Page Width (about 4")		
Base (Zero) Line	.024"	-
Scale-lines and Ticks . . .	.010	000
Year-end Verticals	.017	0
100% Lines	.017	0
Curves:		
Simple Curve Chart . . .	.035	3
Multiple Curve Charts:		
Primary or total curve	.030	-
Secondary curve - solid	.024	-
Secondary curve - dash	.030	-
Secondary curve - dot	-	3
Surface Charts:		
Single curve	.024	-
Total or primary curve	.024	-
Secondary curve	.017	0
Coordinate curves . . .	.017	0
Full Page Width (about 8")		
Base (Zero) Line	.030	-
Scale-lines and Ticks . . .	.010	000
Year-end Verticals	.024	-
100% Lines	.024	-
Curves:		
Simple Curve Chart . . .	.043	4
Multiple Curve Charts:		
Primary or total curve	.035	3
Secondary curve - solid	.030	-
Secondary curve - dash	.035	3
Secondary curve - dot	-	4
Surface Charts:		
Single curve	.030	-
Total or primary curve	.030	-
Secondary curve	.024	-
Coordinate curves . . .	.024	-
COLUMN AND BAR CHARTS		
Number of Columns or Bars:		
1-3 . . . . Base Line	.035	3
1-3 . . . . Outline	.028	-
4-6 . . . . Base Line	.030	-
4-6 . . . . Outline	.024	-
7-9 . . . . Base Line	.028	-
7-9 . . . . Outline	.021	1
10-12 . . . . Base Line	.024	-
10-12 . . . . Outline	.017	0
13 or more . Base Line	.021	1
13 or more . Outline	.014	00
Scale-lines	.010	000
100% Lines	c/	-
Column or Bar Divisions . . .	d/	-
Cross-line Symbols	e/	-

a/ The sample line weights as reproduced approximate the actual weights specified. Small variations may have arisen in reproduction.
b/ Leroy pen numbers. Wrico pens are available in same size but use a two-number system that shows pen size: e.g., pen No. 35 = .035".
c/ Make these the same weight as the outlines.
d/ Make these 2/3 the weight of the outlines.
e/ Make these the same weight as the base line.

SPECIFICATIONS FOR CURVE AND SURFACE CHARTS





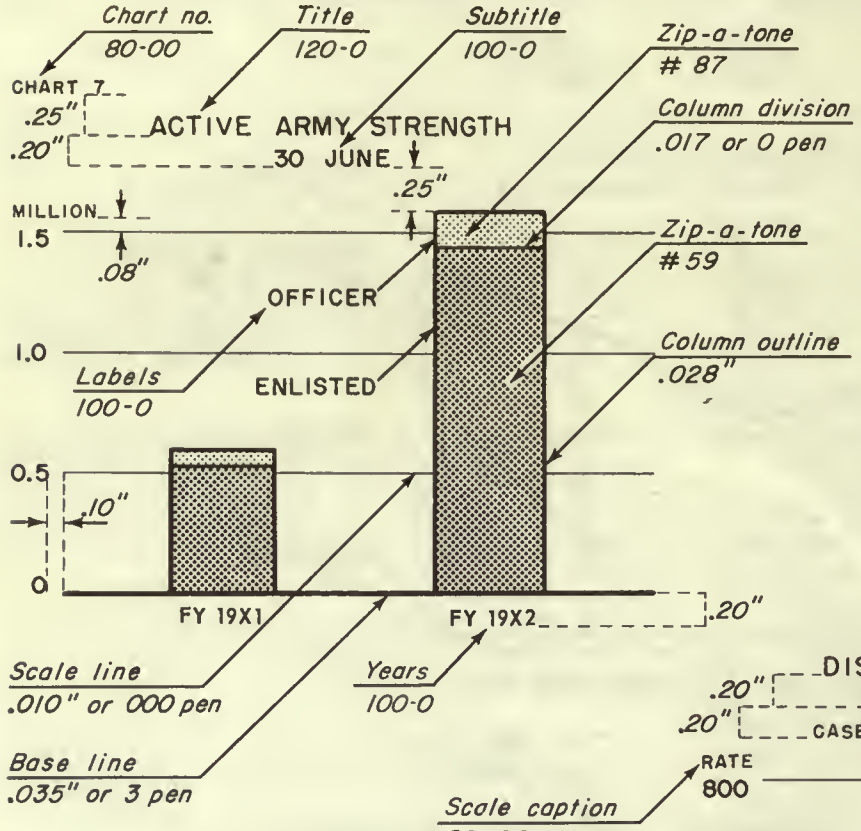


NOTE:
These illustrations have been reduced 16 percent. Lettering designations and line weights refer to Leroy template and pen numbers.

CROSS-REFERENCES:
Curves, lines - pages 98, 104.
Shading - pages 94-96.
Lettering - pages 102-103.

214-853 O - 66 - 7

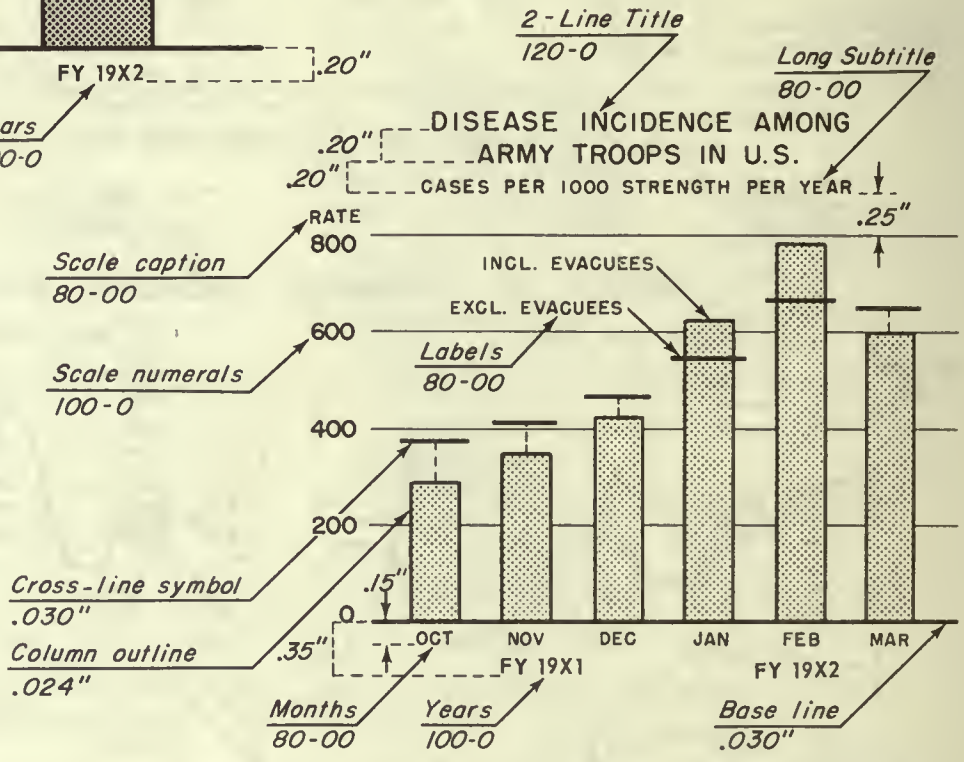
SPECIFICATIONS FOR COLUMN CHARTS

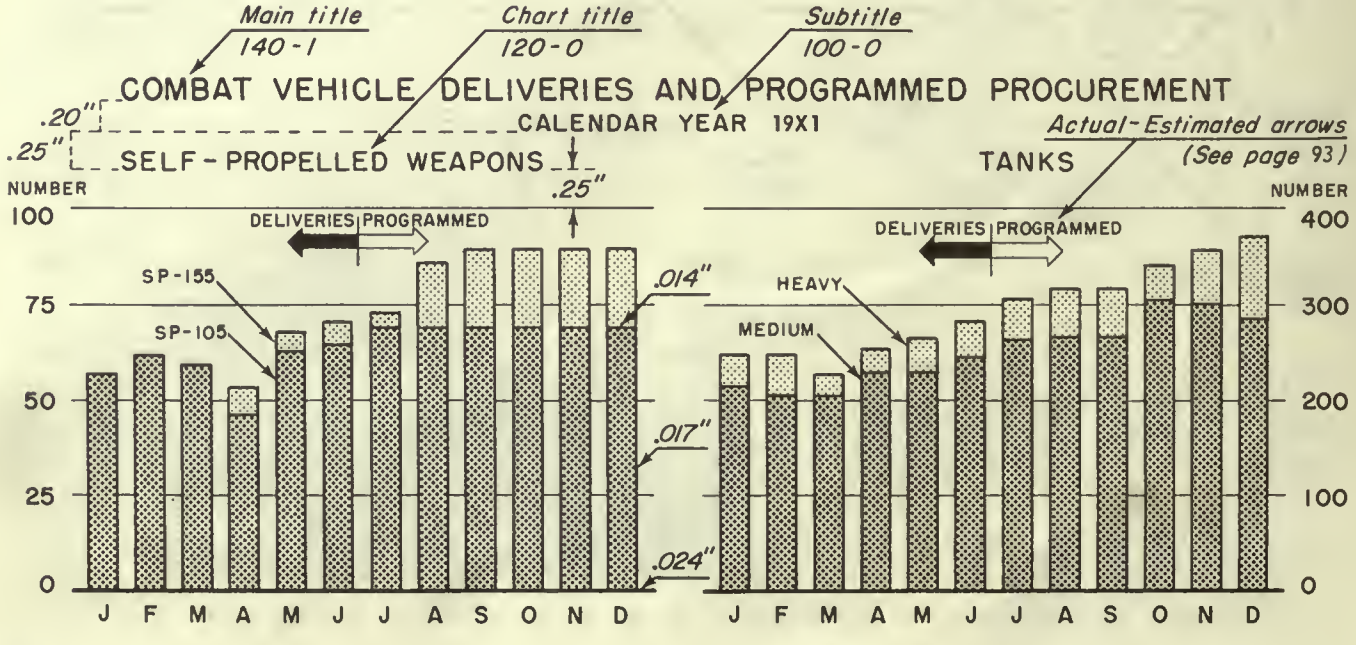


NOTE:
These illustrations have been reduced 16 percent. Lettering designations and line weights refer to Leroy template and pen numbers.

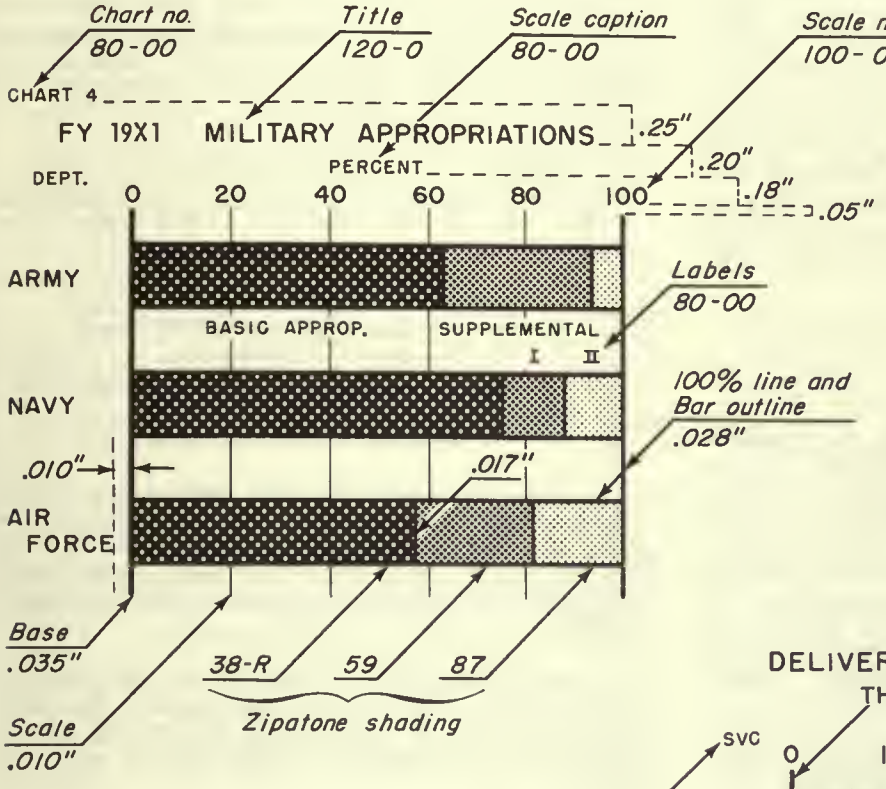
CROSS-REFERENCES:
Column spacing - page 90.
Shading - pages 94-96.
Lettering - pages 102-103.
Line weights - page 104.

NOTE:
Cross-line symbols and step-curves should be heavier than the column outlines (same weight as base line is good rule of thumb). Connecting lines from columns to cross-line symbols should be same weight as scale lines.



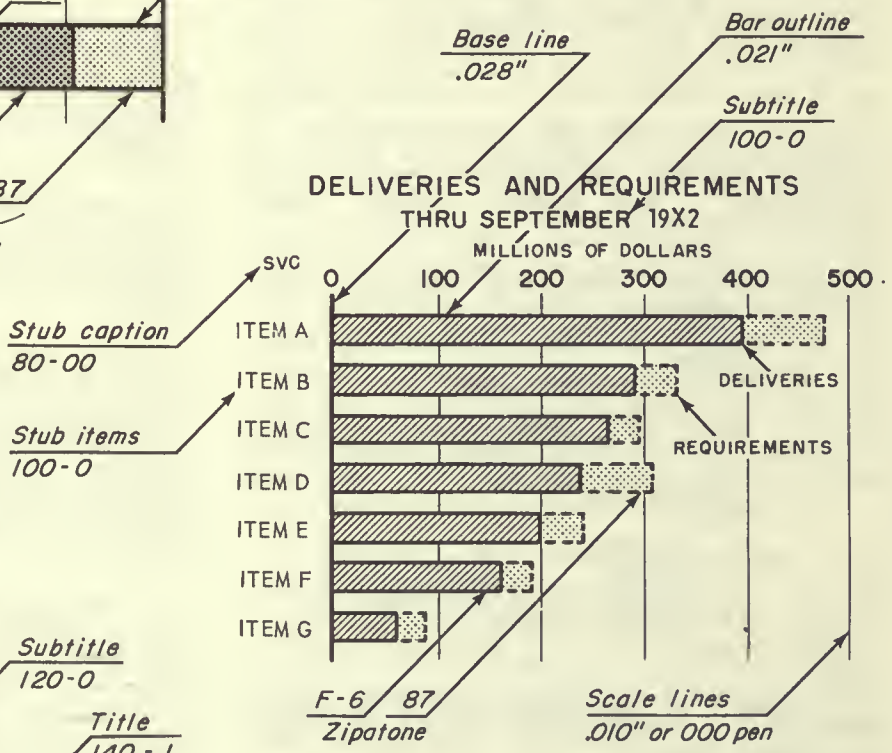


SPECIFICATIONS FOR BAR CHARTS

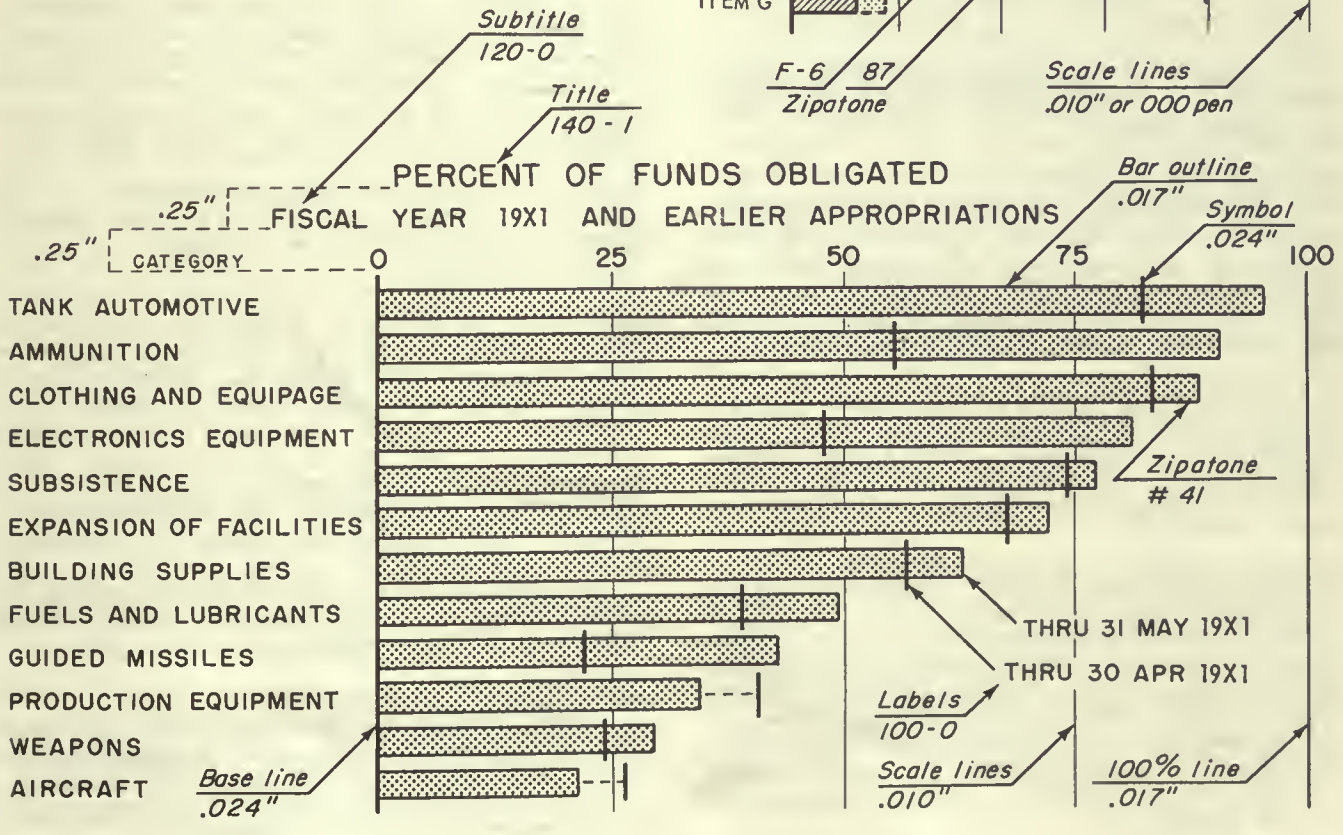


NOTE:
These illustrations have been reduced 16 percent. Lettering designations and line weights refer to Leroy template and pen numbers.

CROSS-REFERENCES:
Bar spacing - page 90.
Shading - pages 94-96.
Lettering - pages 102-103.
Line weights - page 104.



Note that bar spacing and line weights (except for scale lines) vary with the number of bars (see pages 90 and 104).



CHAPTER 5
FORMAT

Format is defined as the shape, size, style and general make-up of publications, reports, pages, tables or charts. These physical characteristics are subject to wide variation. When a series of publications is designed to serve the same general purpose, however, the variation should be kept to a minimum. Uniformity of format contributes greatly to the convenience, efficiency, and usefulness of the series and prevents distracting the reader with superficial details.

REPORT FORMAT

Elements of a Report

The elements of a report are the physical parts that go into its make-up 1/. Since a report may be a single piece of paper, a bulky bound volume, or, more often, something in between it is not possible to establish a standard as to what elements should be included. The only element a report must have is a body. Other elements may be added before and after the body if they are required. The simplest form of a report is all body - more elaborate reports require additional elements.

A complete, formal report could contain all of the following:

1. Cover.
2. Title or security page.
3. Distribution list.
4. Letter of transmittal, foreword, or preface.
5. Contents page.
6. Body.
   a. Introduction
   b. Summary
   c. Detailed review and analysis
   d. Reference material
7. Index.

Because of the importance of the body of the report it is considered first in the paragraphs that follow.

The Body of a Report

Too often the presentation of a report consists of binding together a collection of basic charts and tables without explanation other than a transmitting paragraph. Reports of this type sometimes are misunderstood or misinterpreted and contribute to many erroneous decisions.

Recurring reports, issued frequently for limited distribution, may require only a little explanatory information. This is particularly true when all individuals receiving the report are thoroughly familiar with its content and characteristics.

Observance of the following principles generally will assist in presenting the information in such a manner that the reader can read it easily, grasp it quickly, and understand it accurately.

First, an INTRODUCTION, with or without a heading, is generally desirable at the beginning of the body of the report. It may contain information about:

1. The nature of the subject.
2. The procedure and method followed.
3. The sources of information.
4. The characteristics and limitations of the data.
5. The meaning of special terms.

It is not essential that these items be included in an introduction that is a part of the body of a report. It is important that careful consideration be given to each of these items and that explanations be available to the reader somewhere.

Decisions as to the content of the explanatory material and its presentation must be based on the nature of the material and the needs and technical subject-matter knowledge of expected users.

If, for example, special terms are voluminous, they may be explained under a heading such as Definitions or Glossary. If the sources are many and varied they may be explained under a heading such as Explanatory Notes or in an Appendix. In many cases these special terms and sources can be explained most effectively in footnotes.

Second, the body of the report should contain a SUMMARY of the main findings or results. Depending upon the size and scope of the report, this may be a sentence, a paragraph, a page, or a dozen pages including summary charts and tables. Even when a report covers unrelated subjects, it is often desirable to use a brief summary, giving the key facts about each subject in a digest (either narrative or tabular) at the beginning of the report. Greater detail may be shown in a summary which may precede each of the individual subjects.

Third, a DETAILED REVIEW AND ANALYSIS or other material supporting the summary should be arranged in a logical sequence. To do this, the text, charts, and tables should be presented in judicious combination using each to accomplish the purpose for which it is best suited. They should be placed in the order in which they are to be read. Tables should not be grouped arbitrarily at the back of the report for reference.

Fourth, actual REFERENCE MATERIAL which is not essential to an understanding of the report may appear as an appendix.

Other Parts of a Report

The COVER has two basic purposes: to identify the report and to protect the material inside. Sometimes it serves additional purposes, such as a combination cover and contents page, or a combination cover and foreword.

1/ This discussion of report format is concerned with analytical statistical reports designed to assist top management in making decisions. These are "end-product" reports which generally contain a small portion of the available information selected for its significance. These reports usually are published. Guidance concerning report forms and directives for the collection of raw data is given in DA Pamphlet No. 335-2 and AR 335-10.

Identity is provided by a title, a date, and the name of the issuing agency, and sometimes an appropriate symbol, insignia or design. Protection is provided by a security classification at least as high as the highest classified material in the report, and by a paper stock of sufficient weight to conceal and physically protect the contents over the period of expected use and retention of the report.

The title should be brief yet accurately descriptive. As in all titles, the cover title sometimes can be shortened effectively by reducing some of the description to a subtitle. Long subtitles, however, are almost as undesirable as long titles. A good rule of thumb is to use one line for titles, and no more than two lines for subtitles.

The nature of the data determines whether the date is an "as of" date (e.g., 7 December 1941; 30 June 1945), or a period of time (e.g., June 1945; First Quarter, Fiscal Year 1945; Fiscal Year 1945; or 7 December 1941 - 31 August 1946). Sometimes, the time element of the material has no particular significance, and the date on the cover can be the date the report was issued or completed. Sometimes both the "as of" date or period and the date of publication are needed. At least one of these dates should be used.

The name of the issuing agency is usually that of the higher organizational element to which the actual preparing agency belongs. For example, if the preparing agency is "Office, Director, Review and Analysis, Office, Comptroller of the Army," the issuing agency shown on the cover may be "Office, Comptroller of the Army."

A TITLE PAGE which may also serve as the Security Page generally follows the cover. This page is the first right-hand page inside the cover. It includes the title of the report; its Reports Control Symbol, if any; the security paragraph, if the report contains classified material; and the name of the preparing agency.

A DISTRIBUTION LIST is often, but not always, included in a report after the title page. In a bound volume it is reproduced on the reverse of the title page. It indicates the recipients of the report, and sometimes the number of copies distributed to each of them. The words "DISTRIBUTION LIST" are centered above the listing. The list may be typed in either one or in two columns as described below for the contents page.

This page may contain instructions on how to obtain additional copies or be put on regular distribution for future issues. The best place for such information, including the complete name and address of the office concerned, is below the distribution list, or in its absence, at the bottom of the contents or the title page.

A LETTER OF TRANSMITTAL, FOREWORD, or PREFACE may be included, particularly in a publication superseding another one or in the first issue of a recurring report. It may be used to explain the purpose, scope, and application of the publication. It is placed ahead of the contents page. Some reports have more than one of these three in the sequence shown at the beginning of this paragraph.

The CONTENTS page of a report usually is placed on the next right-hand page. This page (or pages) shows the main organization of the report and indicates the number of the page on which each subject begins. It shows the location of major subdivisions, as well.

When relatively few items are listed, the contents page may be presented in a single column centered left to right on the page. If a single column does not provide sufficient space to list all the subjects covered, the contents may be presented in two columns utilizing the full width of the type page, with three or four spaces between columns depending on whether the full width is an odd or even number of typing spaces.

On the contents page the major divisions of the report are indicated by headings typed in all capitals and aligned at the left margin of the typing width selected. The subordinate divisions and the subject items are typed in initial caps, and indented four spaces,* for each degree of further subordination. Leaders, consisting of periods typed in every other space and lined up vertically, are used to extend the captions to within two spaces of the widest page numbers. A minimum of one blank line is left between major divisions: extra blank lines may be inserted if needed to balance the material on the page, or to equalize the length of columns when the two-column arrangement is used.

Frequently the TYPING AREA required by the contents page fills less than a page. If this occurs, a one-column arrangement should be centered horizontally to occupy not less than 70 percent of the width of the type page. Vertically, about one-third of the blank space should be left above the page heading (to the top of the typing area), and about two-thirds of the blank space left below the last typed line (to the bottom of the typing area). The same procedure should be used for the distribution list and the foreword, or the equivalent.

The INDEX is an important part of many reports. It is an alphabetical, cross-referenced, subject listing at the end of the report with page references for each subject. The sole purpose of the Index is to make all of the material in the report easy to find. The Contents page usually serves this purpose adequately in short reports; but in long, involved reports covering many subjects, a comprehensive Index will more than pay for the trouble of preparing it.

Physical Characteristics of a Report

Report Size. Most Army Statistical reports are reproduced directly from typewritten copy in final sizes of 8" x 10.5" or 9" x 13". The larger size is convenient for use and filing, and it contains a much larger typing area than the 8" x 10.5" page.

* For one-column pages. Indent two spaces for two-column pages.

214-853 O - 68 - 8

The larger typing area allows increased flexibility in the arrangement of material and reduces the number of pages to be processed. In a detailed review and analysis of a series of subjects, it facilitates getting a maximum of text, tabular, and graphic presentation for each subject on a single page or pair of pages, without excessive reduction of material in reproduction. This makes it simpler to find material in the finished report.

The larger size also helps to solve one of the most perplexing problems encountered in preparing many statistical reports: how to get a maximum amount of tabular data in a minimum of space.

The Adjutant General reproduces DA publications in size 8" x 10.5" unless the proponent agency justifies the use of another size because of content and usage.

DA administrative, supply, and equipment publications (most of which are printed rather than reproduced from typewritten copy) are published in the 8" x 10.5" size. This size can be handled more rapidly, especially for mass distribution to many geographic areas. It will also permit the use of automated counting and packaging equipment in AG publication centers. Moreover, the publications can be printed on economical, highly automated presses.

The 8" x 10.5" size is good to use if all or most of the tables in a report fit readily into its smaller typing area. Otherwise, it is easier to prepare the report in the 9" x 13" page size.

The use of larger page sizes than these two is not recommended. Larger sizes are difficult for the reader to use, and present filing, handling, and mailing problems. Use of larger sizes can usually be avoided by adequate planning for a standard page size. The standard sizes generally result in more professional-appearing and readable reports which have better space utilization throughout.

Two-side and One-side Reproduction. Reports reproduced on one side of the paper can be prepared and reproduced faster than those reproduced on two sides of the paper. This practice is wasteful of materials, however, and often makes a long report forbidding in appearance and inconvenient to use because of its bulk.

Two-side reproduction, therefore, is preferred generally for all reports of more than a few pages. A good rule to follow is to use two-side reproduction when a report consists of 10 sheets or more in addition to the preliminary pages and the back cover (if any).

It is highly desirable to present closely related material in such a way that reference may be made to and from related parts without turning pages back and forth, especially in reports showing tabular and graphic information as well as text. Reproduction on two sides of the paper gives twice the area for reference without turning pages and is usually justified on this consideration alone.

PAGE FORMAT

Elements of a Page

The physical elements of a typical page in a formal Army statistical report are the running head, page number, classification label, type page (the "typing area" in which text, tables and charts or other descriptive or identifying material are placed), and the margins. The illustrations on pages 111 and 112 show the usual placement of all elements in the standard page format, and also give the standard dimensions common to each page of a 9" x 13" and an 8" x 10.5" report when reproduced.

RUNNING HEADS usually appear at the top of each page of a report. They are prominent headlines which identify the general subject matter on the page. There is no standard arrangement that is best for all situations, but for any individual report a suitable method ordinarily is suggested by the composition of the material in it. In this manual the chapter title appears on the left hand pages and the major sections of the chapter on the right hand pages.

Stymie Medium type - the style used in this manual because of its similarity to elite typewriting - is recommended for running heads. If it is not readily available, Bodoni Bold type or any similar lettering is an acceptable substitute. Proof sheets of one of these compositions may be cut and pasted at the top center of the typing layout sheet. (See page 98.) If commercially prepared type is not available, the running head may be lettered directly on the sheet with lettering pen and template or some other lettering device. Horizontal rulings are frequently drawn above and below the running heads (as in the illustrations on pages 111 and 112). The top ruling, however, may be omitted.

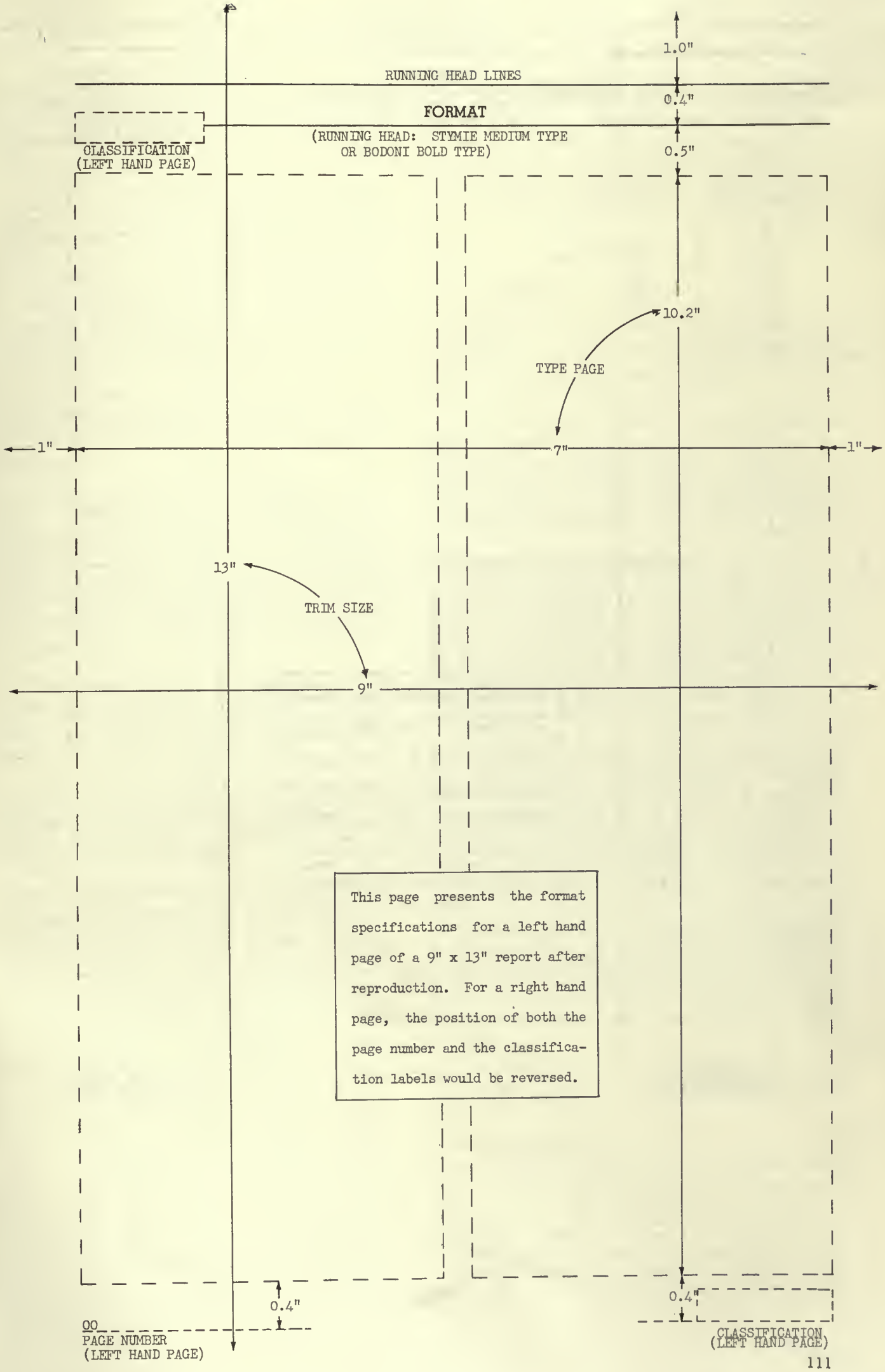
The first pages of the distribution lists, forewords or equivalents, and contents pages do not carry running heads. Instead, the applicable identification is centered above the first typed line in the same style and size of letters as the running heads on other pages of the report, but without the horizontal rulings (or ruling) which customarily set off a running head from the rest of the page. Succeeding pages of these report elements contain running heads with the words "DISTRIBUTION LIST," "FOREWORD," "PREFACE," or "CONTENTS," as appropriate.

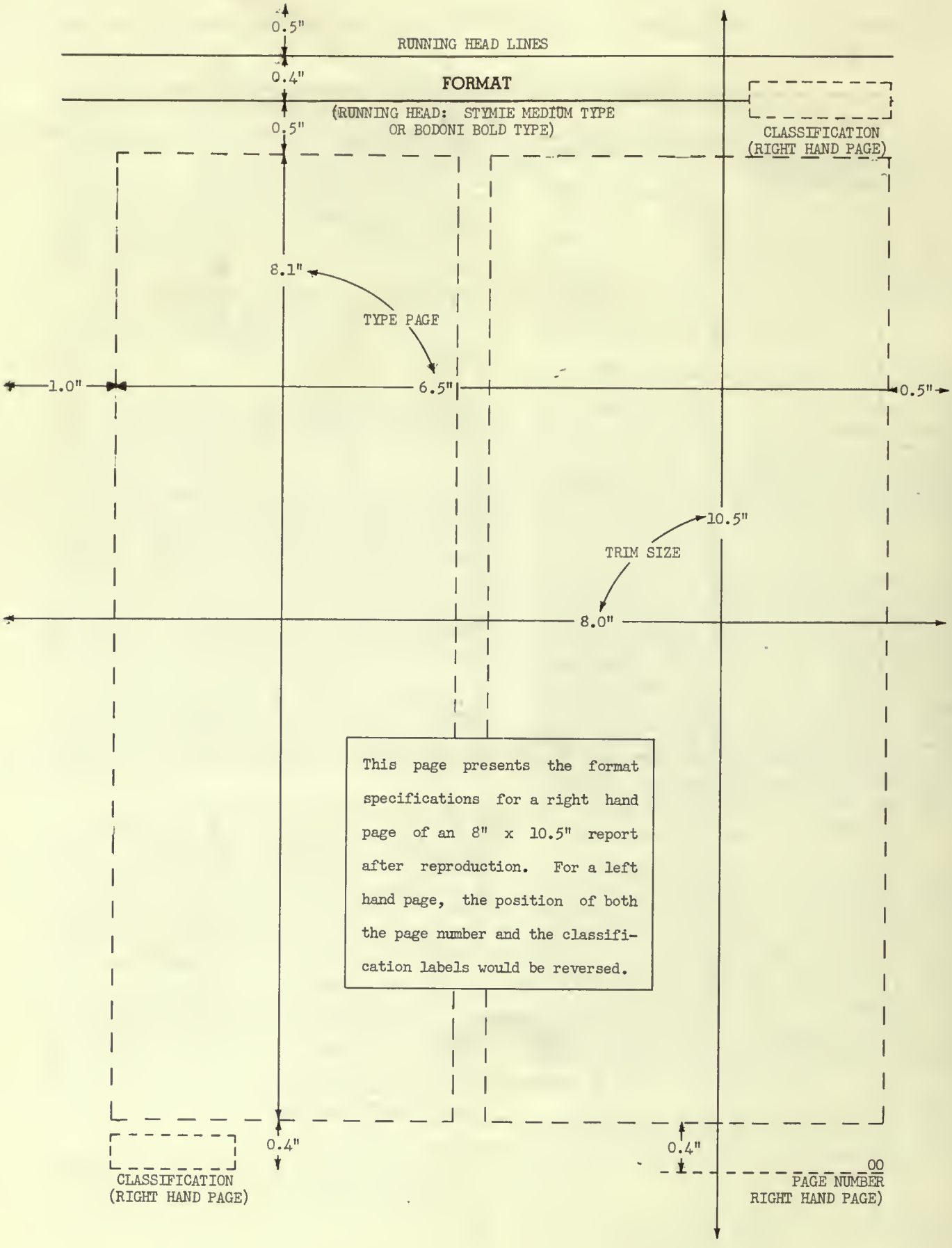
Similarly, no running head is used on the FIRST NUMBERED PAGE of a report. The title of the report is placed on the page in the same type style and size as the running heads.

If the report begins with an introduction or a summary, one of these terms may be substituted for the report title.

If there is no introduction or summary, the title of the first chapter or major subdivision of the report is sometimes used.

CLASSIFICATION LABELS, identifying the material by "Top Secret," "Secret," "Confidential" or other security classification, are attached to each typing layout sheet that contains any classified material, after the final typing on


1.0"
RUNNING HEAD LINES
0.4"
FORMAT
(RUNNING HEAD: STYMIE MEDIUM TYPE
OR BODONI BOLD TYPE)
0.5"
CLASSIFICATION
(LEFT HAND PAGE)
10.2"
TYPE PAGE
1"
7"
1"
13"
TRIM SIZE
9"
This page presents the format specifications for a left hand page of a 9" x 13" report after reproduction. For a right hand page, the position of both the page number and the classification labels would be reversed.
0.4"
0.4"
00
PAGE NUMBER
(LEFT HAND PAGE)
CLASSIFICATION
(LEFT HAND PAGE)


0.5"
RUNNING HEAD LINES
0.4"
FORMAT
(RUNNING HEAD: STYMIE MEDIUM TYPE
OR BODONI BOLD TYPE)
0.5"
CLASSIFICATION
(RIGHT HAND PAGE)
8.1"
TYPE PAGE
1.0"
6.5"
0.5"
10.5"
TRIM SIZE
8.0"
This page presents the format specifications for a right hand page of an 8" x 10.5" report after reproduction. For a left hand page, the position of both the page number and the classification labels would be reversed.
0.4"
0.4"
CLASSIFICATION
(RIGHT HAND PAGE)
00
PAGE NUMBER
RIGHT HAND PAGE)

the white paper is completed. Each page carries the highest security classification of any material on the page. Pages with no material that is classified do not require any classification labels.

Two labels, prepared in advance from proofs of condensed Gothic type or the equivalent and inclosed in ruled boxes, are attached to each classified page. One is centered over the lower line of the running head and aligned with the outside margin. The other is placed below the type page and aligned with the inside margin. The bottom ruling of the box should be about four-tenths of an inch below the type page after reproduction. See the illustrations on pages 111 and 112.

PAGE NUMBERS in the same type face as the running heads are placed at the outside lower corner of each page directly opposite the classification label and the same distance below the type page.

No number appears on the title or security page, but Roman numerals (beginning with II) generally appear on the other preliminary pages, such as the distribution list, foreword or equivalent, contents page, etc. Page "one" in Arabic numerals is usually the first page of the body of a permanently bound report. It is always a right-hand page, as are all other odd numbered pages. All even numbered pages are always on left-hand pages.

Page numbers should be assigned to blank pages, but these numbers should not be reproduced. This insures that odd numbers will continue to be on the right-hand pages and even numbers on the left.

Final copy is normally made on oversized originals which are reduced in reproduction. The TYPE SPECIFICATIONS below show for various reductions the type size (in points) to use for running heads and page numbers:

Percent Reduction of Page	Running Heads		Page Numbers	
	Stymie Medium	Bodoni Bold	Stymie Medium	Bodoni Bold
	With Double Ruled Running Heads			
10	18	18	12	14
16	18	18	12	14
20	18	18	12	14
25	24	24	18	18
30	24	24	18	18
36	24	24	18	18
	With Single Ruled Running Heads			
10	12	14	12	14
16	12	14	12	14
20	12	14	12	14
25	18	18	18	18
30	18	18	18	18
36	18	18	18	18

The following line weights (in inches) are applicable to the running head rulings and the rulings of the box inclosing the classification label.

Percent Reduction of Page	Running Head Rulings	Classification Box Rulings
10	.017	.010
16	.017	.010
20	.017	.010
25	.020	.012
30	.020	.012
36	.024	.014

NOTE: These type sizes and line weights apply to both 8" x 10.5" and 9" x 13" reports.

Both TEXT and TABLES are generally typed on 12-pitch typewriters (that is, 12 characters to the inch) equipped with standard Elite letters (the kind used for these pages). Text for published reports is usually typed six lines per inch when single spaced, except as noted under the TEXT PRESENTATION chapter of this manual.

One-column and Two-column Pages

Material placed in the type page area of a page may be presented in either a one-column or two-column arrangement. The two-column format, used in this manual, is generally preferred because the text is easier to read, and more text can usually be placed on the page. The two column arrangement permits greater flexibility in alternate use of tables and charts that are a half-page-wide and those a full-page-wide.

A long line of type is harder to read than a short one. The best length for easy reading is a line 39 to 52 characters long. In typewritten reports, however, a column of typing 39 characters wide is so narrow that the typist has difficulty in making the lines come out even at the right. A column should be at least 45 characters wide to provide sufficient flexibility to permit the typist to avoid or to adjust short lines.

Two-column text is preferred if a page is sufficiently wide for a minimum of 93 typewriter spaces (each column 45 characters wide, with at least three spaces between columns). Satisfactory text also may be typed in columns that are 43 characters wide with four spaces between the columns.

For pages containing a typing area width of less than 93 spaces, the one-column text usually should be used.

Layout and Organization

The layout process between the submission of manuscript and the final copy is considerably more difficult for tables and charts than it is for the text. The requirements of presentation and of content often conflict, making necessary numerous compromises that must be worked out before final copy is prepared. In designing a page on which a table or a chart is presented with text, the table and chart should be planned first since they are much less flexible than text.

The general requirements of the whole page must be kept in mind, however, while designing the table or chart in order to attain the proper emphasis.

Many statistical reports have a "sameness" from page to page which may make an inherently interesting report dull and uninteresting. It takes two forms:

1. Lack of variety in the types of charts used.

2. Close similarity in the arrangement of the text, charts, and tables.

The repeated use of one or two standard types of charts in a report seldom is desirable. Many types from which to choose are shown in the chapter on Graphic Presentation. If a report contains many charts, several types are generally needed to make the best comparisons. The pages may be diversified by making some of the tables and charts a full-page-wide and some of them a half-page-wide. Variations also may be made in the amount of space allotted to each subject, the amount of text and types, number, and sizes of charts and tables.

The amount of time available for layout and organization of reports necessarily affects the quality of the reports. If it is essential to meet an extremely short deadline, it is obvious that something must be sacrificed.

Sometimes time can be saved by preparing and reproducing semi-finished charts and tables (complete without data and footnotes) before the raw data are received. This greatly reduces the period from receipt of the data to the completion of the final copy for reproduction.

A logical arrangement should be followed in presenting statistics if they are to be clear and easily understood. Correct use of the tools - charts, tables, and text - will help to insure an orderly sequence of data and the completion of each subject before the introduction of another. Good planning almost always results in putting near each other the things that belong together. Otherwise, the report becomes disjointed and the reader is apt to lose interest. For example, it is improper to put a chart on page nine when it belongs with the material on page three, simply because there was more extra space on page nine.

When a page contains closely related text, charts, and tables, it is generally preferable to connect the charts and tables by placing some of the text between them. This gives the presentation a balanced look and leads the reader naturally and smoothly from one chart or table to the next.

In assigning space on a page, allowances must be made for standard separations between text, tables, and charts. The established separation is two typewriter lines. When space is "tight", this may be cut to one; or, when space is more "loose", increased to three lines. The standard separation for a text table is one blank line from the text which precedes and follows it.

When one-column text is used in a report, it may be continued beside half-page-wide charts and tables. The "runaround" text should be separated from the charts and tables by three or four blank typewriter spaces, depending upon whether the layout sheet has an odd or even total number of spaces. This problem is not often met in a two-column presentation.

If a table comes at the bottom of a page of text, the tabular and text footnotes should be clearly differentiated. The method of doing this varies, depending on whether the table is half-page-wide or full-page-wide and whether the text is one-column or two-column. The following arrangements show the successive order of text, table and footnotes which usually works best for each particular situation:

1. Half-page-wide table and 2-column text

   Text
   Two blank lines
   Table
   Tabular footnotes, no wider than table
   Blank line
   Separator ruling (10 spaces wide)
   Text footnotes

   If the other text column also has footnotes, put them at the bottom of that column following the standard blank line and 10-space separator ruling.

2. Full-page-wide table and 2-column text -

   Text
   Blank line
   Separator ruling (or rulings - one under each text column - if both text columns have footnotes) 10 spaces wide
   Text footnotes (under each text column if necessary)
   Two blank lines
   Table
   Tabular footnotes

3. Half-page-wide table and 1-column text with runaround text beside the table -

   Text
   Two blank lines
   Table
   Tabular footnotes, no wider than table
   One blank line
   Separator ruling, 20 spaces wide
   Text footnotes, full-page-wide

4. Full-page-wide table and 1-column text -

   Text
   Two blank lines
   Table
   Tabular footnotes
   One blank line
   Separator ruling, 20 spaces wide
   Text footnotes

Narrow and Broadside Pages. Whenever possible, material should be arranged so that it will read across the narrow or short length of the page.

This upright arrangement should be used for charts and tables. Material should be presented to read broadside or the long way of the page only in extreme and rare cases. Some effective method of avoiding this arrangement can almost always be found.

Particular effort should be made to avoid the use of broadside material in an upright report where the broadside material is at right angles to the text. This makes it unnecessarily difficult to read.

Fold-in Pages. A folded page bound with a report is extremely undesirable. It is only rarely that this expedient is the best compromise in presenting material in reports. Some material that cannot be presented effectively on one page may be redesigned as a "double-page spread," arranged on two facing pages. Other alternative arrangements are discussed in some detail in the chapter TABULAR PRESENTATION. (See pages 39 and 40.)

BINDING METHODS

When a report has more than one page, the pages should be fastened together. Fastening and binding methods range from a single staple in the upper left corner to sewn and glued bindings used in bookmaking. For most typewritten statistical material, binding methods between these two extremes are better.

Binding methods can be divided into three categories:

1. Stitching or sewing.
2. Mechanical binding.
3. Loose-leaf binding.

Stitching

This group includes both stitching and sewing with binding thread, corner stapling, side wire stitching, and saddle (wire) stitching. Sewing is generally used only when the presentation is to be a bound book, and so is not described here.

Corner Stapling - this is the quickest and easiest binding method. It is good for a few sheets of an informal presentation. It is used frequently for Army statistical reports.

Pages stapled in this way tear loose easily, so this method should not be used for papers that will be handled a lot.

Pages printed on two sides may be printed "tumble" style (the back upside-down), but this can be a nuisance.

Side Stitching - in this binding method, wire stitches or staples are driven through the sheets in the binding margin. This method is quick and easy, but it has two disadvantages: (1) Side bound publications are hard to open and will not stay open unless the pages are folded back and heavily creased. (When there are a lot of pages even this does not work very well). (2) Stitching in the side margin uses about a half inch of the margin, and the thicker the report the bigger the margin must be. The copy area on the page, therefore, must be narrower, which results in less copy per page.

Saddle Stitching - in this method, folded sheets are opened in the middle and placed over the "saddle" of the stapling machine. Two or more staples are then driven through at the back fold and clinched on the inside. Saddle stitching is not good for thick volumes. Also, it requires that printing be done on sheets that are two pages wide (which means that the first page is printed on one half, and the last page on the other half of the same sheet; and so forth). Saddle stitching has one big advantage: the pages lie relatively flat when the publication is opened. Because of the location of the stitching, less binding margin is needed and more of the page width can be used for "copy."

Mechanical Bindings

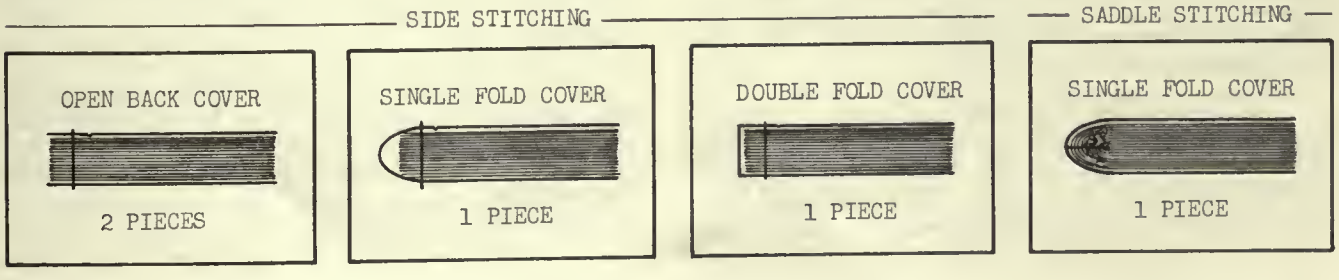
Mechanical binding methods were developed to combine the advantages of side stitching and saddle stitching. The best known are the spiral binding (a coiled wire threaded through a large number of small holes) and the plastic binding (a cylindrical plastic "comb" with the teeth inserted through a series of slots). These and other patented bindings come in several sizes. They generally require special equipment not available in many offices. The main advantages of these types of binding are that they permit the sheet to lie flat, and need only a narrow binding margin.

Both stitching and mechanical bindings are relatively permanent: that is, bound sheets cannot be removed or new sheets added without unbinding.

Loose-Leaf Binding

These binding methods include brass fasteners and similar binding devices as well as ring binders. Sheets for all loose-leaf binders must be punched with two or more holes.

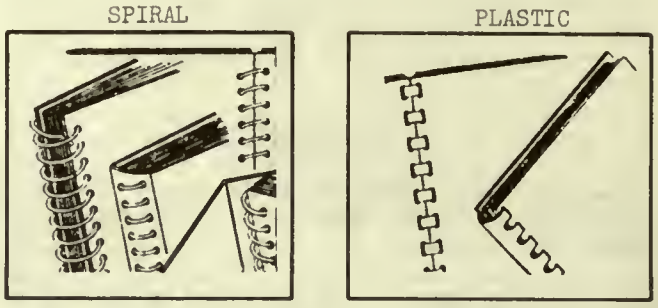
Fasteners - these are strips of soft metal that are put through the punched holes and then bent to hold the sheets together. Some fasteners are loose and some are attached to covers. The simple brass fasteners (two pivoted prongs joined at the base in a flange) are the cheapest.



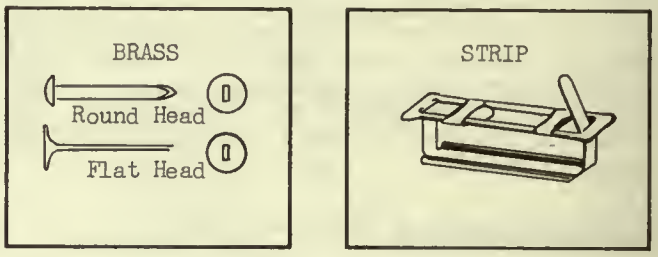
BINDING METHODS - WHEN TO USE EACH

CORNER STAPLING	A few sheets - informal presentation - when time is short. Semi-permanent - best with thin paper - lowest cost.
SIDE STITCHING	A few sheets, to a report half an inch thick (special equipment will stitch books up to 1 1/2 inches thick) - semi-permanent - a low cost method.
SADDLE STITCHING	Formal presentations such as annual reports, printed booklets, etc. - quick method but requires careful planning of pages - opens flat - a low cost method.
FASTENERS	When sheets are to be removed (or added) later - a few sheets to half an inch thick or more - medium cost.
RING BINDERS	When sheets are to be removed (or added) and must open flat - a few sheets to an inch or more (depending on diameter of rings) - best loose-leaf type - not recommended for many copies - highest cost.
MECHANICAL BINDING (Spiral, Plastic, etc.)	When sheets will not be removed (or added) but must open flat - high cost.

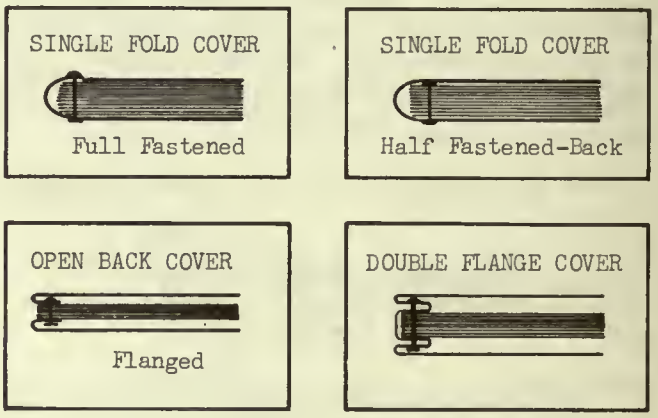
MECHANICAL BINDINGS



FASTENERS



COVERS WITH FASTENERS



Fasteners are available in several lengths: short, for a few sheets; and longer, for many sheets. The accompanying illustrations show several methods of fastening sheets in - and to - cover stock with fasteners of this kind.

The strip fasteners (see illustration) also come in different lengths, separate or attached to binders. They are used in the same way as the brass fasteners, but they are a little faster and easier to handle. These are best used as a semi-permanent binding.

Rigid metal posts or screws - such as those used in post binders - are widely used for accounting records, but they are too clumsy for most statistical presentations. They have the same disadvantages as fasteners, and also the disadvantages of ring binders.

Fasteners are a medium-cost binding method. They should be used for a few copies only. Their principal advantage is the loose-leaf feature - sheets can be added or removed easily.

The principal disadvantage is that they are unwieldy: the pages do not open flat, and the more pages there are, the more trouble this is.

Ring Binders - these are available in any size from vest pocket to large display size, with various numbers of rings, and in many kinds of covers, from cardboard to leather.

Two or three rings is the standard for letter size, three for larger pages. When more than three are used, a punching problem arises. Two-hole punches (7" center to center), and three-hole punches (4 1/4" center to center), are the standard, and the only ones that are widely and cheaply available. The diameters of the rings generally range from 1/2" to 1 1/2" in letter size binders.

Ring binders are heavy, bulky, expensive, and hard to label. They also require considerable file space and should be used only when interchange of pages and flat opening are of prime importance.

CHAPTER 6
PRODUCTION TECHNIQUES

The preparation of a report is a difficult job at best: it can be a nightmare unless the contents are planned carefully, developed systematically, and reviewed methodically. The application of sound production techniques will not guarantee a good report, but failure to apply them will result almost invariably in a poor report with undetected errors, lack of balance, incomplete coverage, and unsatisfactory presentation of the material.

ORGANIZING THE MATERIAL

A report should be carefully planned before the work of presenting it is started. The first step in planning the report should be to define both its purpose and scope, so as to provide a criterion for judging the pertinence of all subsequent work.

As soon as the nature and extent of the data and their likely implications are apparent, the organization of the report should be planned. As text, tables, and charts are developed, this preliminary organization should be revised as necessary, the overall structure being kept in mind while the details are developed. When this method is followed, the parts should grow into a unified whole, rather than being forced into a pattern after they have been completed independently of each other.

Preparing an Outline

A good way to start is to prepare a tentative list of contents and assign space for each item in accordance with its importance. This will force summarization of more voluminous data on the relatively unimportant subjects and the expansion of and perhaps more thorough analysis of the more important subjects.

In preparing the list of contents, try to group related items together and arrange the groups, as well as the material within each group, in a logical order. This process should be continued to the organization of each of the items, so that a working outline results, which needs only to be expanded in developing the complete report.

Making the Report Dummy

After the content of the report is fairly well crystallized, but before any of the parts are prepared in final form, the physical features of the report should be considered. At first, a tentative report dummy should be prepared, showing as many pages, including blank pages as the total number planned for the report.

The material to be presented on each page should then be indicated in pencil. This helps to determine the size and shape of the tables and charts which must be placed on the same page with text or with each other and, particularly, aids in arranging related material in an adjacent position or on facing pages. Several adjustments of the material to be presented may be necessary to make it conform to the relatively inflexible conditions imposed by page and report format. These limitations should constantly be kept in mind in preparing any final pages.

Production Schedule

With the dummy as a blueprint, the production of the report should be planned step by step and checked periodically against the schedule. Each page and each insert (chart or table) should be listed separately. The steps to be planned and checked separately will probably include those listed below. Often two of these steps can be combined for control purposes.

1. Tables designed.
2. Text written.
3. Charts sketched.
4. Trial typing made.
5. Final typing made.
6. Tables ruled and text underlined.
7. Charts drawn.
8. Pages assembled, numbered, and classification labels affixed.
9. Final check and review made.

PREPARING COPY

In developing a report for publication a distinct function must be performed after the manuscript is completed but before final copy is prepared. This function may be thought of as page make-up or layout, or page design. It is not the function of the draftsman or the typist and should not be left to either, but should be handled by the person preparing the report or by a specialist in this field.

Typing Layout Sheets

The procedures for designing pages and preparing typed and drafted material are greatly facilitated by the use of typing layout sheets. These are sheets of paper ruled to correspond to typewriter spacing and drawn in proportion to the standard format dimensions of the report.

TRIAL TYPING of text and tabular material may be done directly on typing layout sheets from manuscript, without any preliminary typing on other paper. Decisions as to final page arrangement are more easily reached because the limitations of the format are kept constantly before the person preparing the page. Furthermore, instructions to the typist for changes or adjustments are more easily given and understood when specified on the layout sheet than when shown on ordinary paper.

The principal purposes of such trial typing, other than to provide as clean copy as possible for final typing, are: (1) to determine the space requirements for the text and tables; (2) to check and revise, if necessary, the tentative page arrangement; and (3) to serve as a basis for justifying the lines.

CHART SKETCHES may also be made on typing layout sheets (see "Using Typing Layout Sheets for Charts," below).

Specifications of Standard Typing Layout Sheets. Standard blank forms are used in Headquarters, Department of the Army for reductions of 16, 30, and 36 percent for 9" x 13" reports. These sheets after reproduction have about the same format specifications as those shown on page 111. The sheets can also be used for other reductions for 9" x 13" reports and to prepare pages for 8" x 10.5" reports which will reduce to about the same format specifications shown on page 112 (see "Using Typing Layout Sheets for 8" x 10.5" Reports and for Other Reductions", below).

An additional layout sheet for 8" x 10.5" pages is available. It is marked for reductions of 10, 15, and 20 percent.

The dimensions of the 9" x 13" standard layout sheet for a 16 percent reduction are specified in the illustration on the facing page. Note that:

1. The spacing of the vertical rulings is the same as the spacing of letters typed on an elite typewriter (12 per inch) and the spacing of the horizontal rulings is the same as the spacing of single-spaced lines on any standard typewriter (6 per inch). Thus, each small rectangle defines the space in which a character may be typed.

2. The ruled area corresponds to the type page. The running head lines are indicated at the top of the page, and the location of the page number (in the lower outside corner) is also shown.

Typing layout sheets may be used for either one-column (full page wide) or two-column text, charts, and tables (half page wide). The full width of the type page is used for one-column presentations. For two-column presentations, the type page is divided into two columns of equal width separated by three or four blank typewriter spaces (three if the type page has an odd number of spaces; four if it has an even number). The accompanying illustration contains two columns of 48 spaces each, separated by four blank spaces.

The sheets are printed on an inexpensive green or yellow paper for trial layouts and on a better grade of white paper for final (camera-ready) typing. The lines are printed in a light blue ink which do not reproduce when the material on them is photographed with most standard film.

Using Typing Layout Sheets for 8" x 10.5" Reports and for Other Reductions. Each of the three standard typing layout sheets for 9" x 13" reports can be used to prepare pages of the same reduction for 8" x 10.5" reports by applying the type page (typing area) dimensions in typewriter spaces and lines indicated in the second and third columns of the table on this page (for reductions of 16, 30, or 36 percent as appropriate). The page numbers are usually placed at the outside margin three or four typewriter lines below the last line of the type page, as revised - three in page reductions of 16 percent and four in page reductions of 30 and 36 percent. The running head rulings in black ink on the final copy should be as wide as, but no wider than the revised type page.

When the typing layout sheet on the next page is used for an 8" x 10.5" report it would utilize 93 spaces and 61 lines. The type page would end on line 58 and the page number would appear on line 61.

In both 8" x 10.5" and 9" x 13" reports use the 16 percent reduction typing layout sheet for page reductions of 10 and 20 percent and the 30 percent reduction typing layout sheet for page reductions of 25 percent. The type page specifications for those reductions shown in the table on page 113 are applicable and the page numbers are uniformly placed on the third line below the revised type page.

The standard dimensions of the 16 percent reduction typing layout sheets are not suitable for a 20 percent reduction to the 9" x 13" size. This reduction requires using five additional spaces and four additional lines with the type page ending on line 77 and the page number appearing on line 80. The running head lines must then be extended to the full width of the type page.

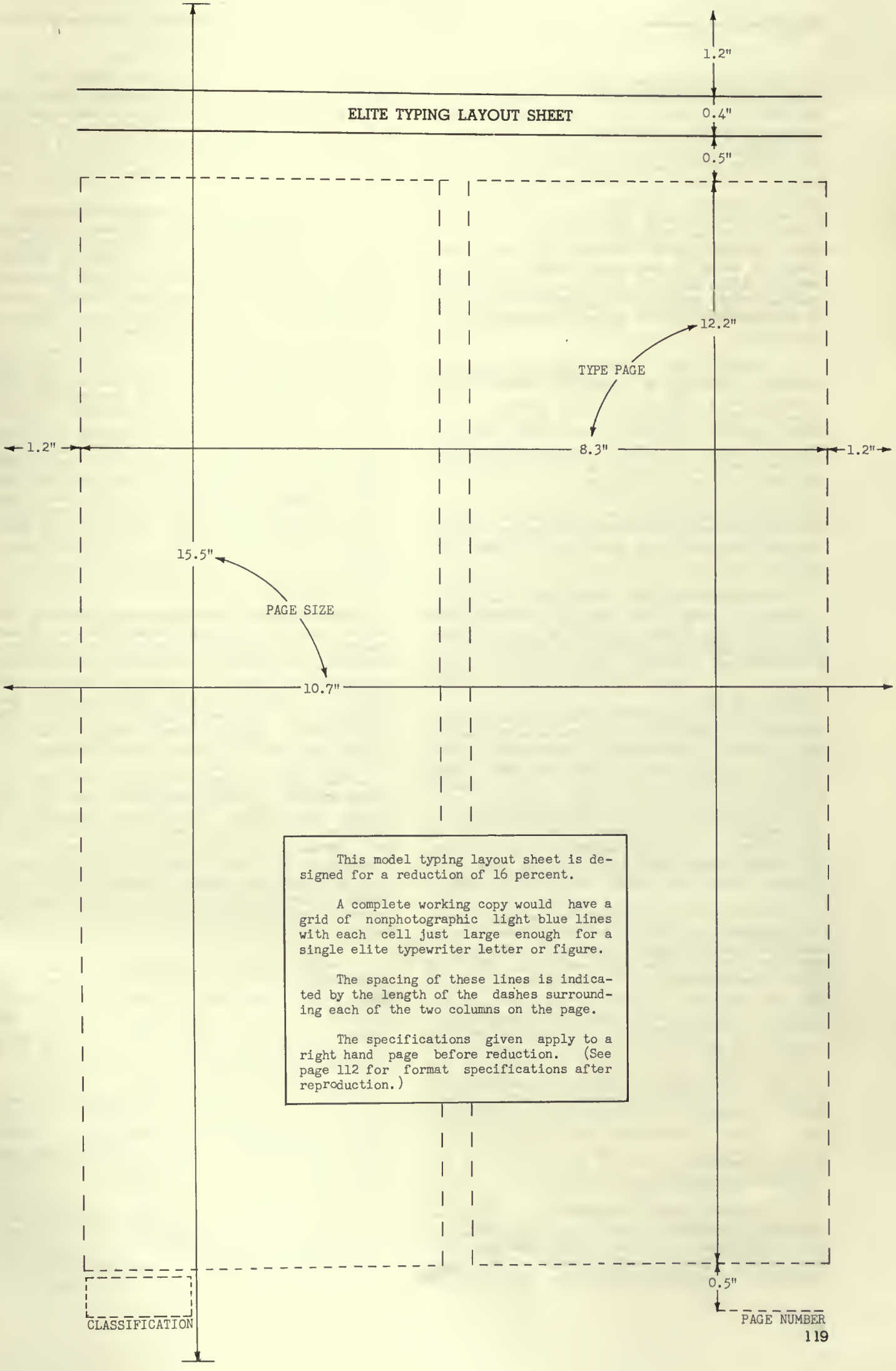
Adjusting the Length of the Type Page for Deletion of Running Heads. Running heads are sometimes omitted, especially in short reports. In such cases, the type page should be lengthened by utilizing the space normally occupied by the running head.

The number of typewriter lines by which its length can be increased depends upon whether or not classification labels are required. The following table shows the length in lines of the type page with and without classification labels but without the running head:

Percent Reduction of Page	Report Size: 8" x 10.5" a/		Report Size: 9" x 13" a/	
	With Labels b/	Without Labels	With Labels b/	Without Labels
10	56	60	70	74
16	60	64	75	79
20	63	67	79	83
25	68	72	85	89
30	72	76	91	95
36	80	84	100	104

a/ See pages 111 and 112 for length of type page when running heads are used.

b/ Align one classification label with the outside margin of the type page and place the top ruling of the box inclosing the label four lines above the type page. Place the other label in its customary position at the inside lower margin directly opposite the page number and an equal distance below the type page. (See page 111.)



This model typing layout sheet is designed for a reduction of 16 percent.

A complete working copy would have a grid of nonphotographic light blue lines with each cell just large enough for a single elite typewriter letter or figure.

The spacing of these lines is indicated by the length of the dashes surrounding each of the two columns on the page.

The specifications given apply to a right hand page before reduction. (See page 112 for format specifications after reproduction.)

Using Typing Layout Sheets for Charts. Although primarily intended for the typing of text and tables, typing layout sheets are also convenient to prepare chart sketches. If the chart as finally drawn is to be given the same reduction as the other material appearing on the page with it, the rulings on the layout sheet make it easy to determine the number of typewriter lines and spaces needed for the chart and the number remaining on the type page for other information after the chart has been designed. The final chart is drawn to the same overall size as the sketch, either directly on the layout sheet containing final copy or on a separate sheet which is then affixed in its proper place on the layout sheet.

A complex chart which needs more room for effective drafting of necessary detail may be prepared for a larger reduction than the other material on the same page. It is wise in such cases to make the chart sketch and the final drawing equal in size. The space requirements for the chart are computed by the method described below for oversize tables.

Typing layout sheets may also be used in the design of charts for transparencies, slides, and posters as well as charts for printed reports.

Chart sketches may be reproduced and distributed for comment and coordination with other offices before final decisions as to content, lettering, spacing, coloring, etc. This is sometimes referred to as the "precharting" technique.

Oversize Tables

A larger reduction for a table which will occupy a full page when reproduced will require more than the normal number of typewriter spaces and lines. The entire page is then given a larger reduction - as determined by the number of additional spaces and lines needed to type the table - than the other pages in the report. For example, if the normal reduction of the pages in an 8" x 10.5" report is 16 percent, an oversize table that fits into 111 spaces and 69 lines would take a reduction of 30 percent.

When an oversize table takes up only a part of a larger type page, the excess space may be used for text or charts. Since all of the material then receives the same reduction, the text on the reproduced page will not be as legible as that on other pages reproduced at a smaller reduction. This is a serious defect in page reductions of more than 20 percent and can be avoided in the photo offset process or reproduction.

The photo offset process allows oversized tables to be prepared separately for larger reductions than the material on the rest of the page. Separate negatives made at the two different reductions are stripped together and the image is transferred to a zinc plate for the final reproduction on the finished page.

A table prepared in this manner must be carefully planned to insure that it will be reduced in proper proportion to fit the available space. For example, a full-page-wide table 100 typewriter spaces (8.3") wide by 18 typewriter lines (3") long for a 9" x 13" report will be 7 inches wide by 2.5 inches long after being reduced 16 percent. The original dimensions of a table planned for the same space after a reduction of 30 percent would be 10 inches (7 ÷ 0.70) by 3.6 inches (2.5 ÷ 0.70) or 120 spaces (10x12) by 22 lines (3.6 x 6).

In either case, if the other information on the page with the table is reduced 16 percent, it should be typed in an area 100 spaces (8.3") wide by 55 lines (9.2") long - including 2 blank lines to separate this material from the table. The type page after reproduction will then be 10.2 inches long (2.5 inches for the table plus 7.7 inches for the other material).

Prepared Materials

Many expedients may be developed that are helpful in preparing final copy for reproduction. Some of these, such as the reproduction in quantity of repeating elements, depend on the forethought and ingenuity of the personnel producing the report copy. Others, like the use of prepared shading sheets for applying tones and patterns to charts, involve prepared materials that are available commercially. It is important to take advantage of all such expedients in order that reports may be produced quickly and economically and that their appearance may be of a quality commensurate with their content.

MASTER FORMS, containing all repeating elements (such as running heads, titles, column headings, and rulings), may be prepared and reproduced in appropriate quantities when a number of tables or charts of a similar nature are presented in a uniform manner. This procedure provides partly finished originals which are then filled in to completion thus saving a great deal of time and assuring uniform presentation.

Most master forms are made the same size (with the same format specifications) as the typing layout sheets used in the report. If necessary, they may be made larger to accommodate the material. If typewritten material is entered on the forms, however, the extra reduction is likely to result in copies that are difficult to read. For example, master forms for oversize tables should not be designed for a larger reduction than 36 percent.

Master forms may be designed for a series of oversize tables or charts which occupy less than a full page when reproduced at a larger reduction than the other material on the same page. The size of the forms is determined by the space occupied by the tables or charts after reproduction and the percent of reduction.

EXAMPLES: The original charting area dimensions of a master form for a series of charts for a 9" x 13" report, each chart to be 7 inches wide (full-page width) by 4.5 inches long (less than full-page length), are as follows before reductions of 25 and 30 percent:

1. 25 percent. 9.3 inches wide (7 ÷ 0.75) by 6 inches long (4.5 ÷ 0.75).

2. 30 percent. 10 inches wide (7 ÷ 0.70) by 6.4 inches long (4.5 ÷ 0.70).

When ordering master forms, the reproduction office should be cautioned that high quality work is necessary in order that copies may be suitable for further reproduction.

PROCESSING COPY

Report processing is divided into two basic steps. In the first, all the component parts of the report are typed or sketched; then proofed, edited, and dummied to form complete pages. In the second step, these pages are translated into final "camera ready" copy by retyping the text and tabular material (preferably on an electric typewriter equipped with a carbon paper ribbon); by preparing the charts as finished inked drawings; by assembling and marking all copy for reproduction; and by a final check for accuracy and completeness of the material.

Procedural Guides to Good Copy

The preparation of the page dummy which completes the first step, puts the report in semi-finished form. Using as a guide the report dummy, the text and tables are cut and pasted in the places assigned to them on each page, and space for each chart and each oversize table is marked off.

Last-minute corrections and changes are often necessary at this time. They may be minor, such as changing a word or two; or extensive, such as major changes in text, tables, or charts to remedy faulty layout, spacing, or other aspects of design. Major alterations may necessitate changes in arrangement of material on other pages of the report.

One source of trouble stems from the ease with which a chart can be adjusted to a given space. The result is a tendency to prepare text and tables first and to squeeze the charts to fit the remaining space, giving them less emphasis than they should have.

Decisions concerning allocation of space to text, tables, and charts affect both arrangement and relative emphasis, and should be made when the report dummy is prepared (subject to review and revision as the production of the report progresses).

Before final copy preparation is started, all material should be marked to indicate exactly how it is to appear in final form, so that typists and draftsmen can convert it verbatim into finished "reproduction originals." This means that all information necessary for converting the chart sketches into completed inked drawings and retyping the text and tables should be provided, as indicated below.

1. For chart construction the following are essential: accurate sketches and separate data sheets for each chart. The tabular material that is submitted for inclusion in the report frequently requires further processing for plotting purposes. For columns or bars that are segmented, for example, the values of the segments should be cumulated from the base line, so that the draftsman can plot each segment from that line rather than from the preceding segment. Key numbers should be entered to indicate the page on which each chart is to appear.

2. The final typing of text and tables should be keyed to the page dummy which shows the page sequence and exact position of each part of the material.

3. Corrections and changes which can be indicated clearly and easily followed, such as minor revisions in text and tables and simple adjustments in spacing, may be shown in pencil on the preliminary copy. Major revisions usually involve retyping some of the text or tables or redrawing some of the chart sketches prior to preparation of final copy.

ASSEMBLING COPY

The report dummy previously discussed, revised, if necessary, to reflect the final decisions as to paging, allocation of space, and arrangement on the page, serves as a basis for assembling copy for reproduction. Some one person should be responsible for this important procedure. At this stage of report production, all the material is seen together in finished form for the first time, and it is at this point that unanticipated problems of continuity, page arrangement, and other physical details may come to light. The general steps to be followed are as follows:

ASSEMBLING THE MATERIAL BY PAGES and checking it with the dummy. Changes in unsatisfactory pages can be made at this stage.

INDICATING PAGE NUMBERS on each page and on each piece of copy to be inserted on the page. Pages should also be marked to indicate where each insert goes, and the inserts also should be marked to indicate their position on the page.

CHECKING OF COPY FOR SIZE to make sure that all material will fit properly on the page. All inserts should be checked to see that proper instructions are given for reproduction, especially when they require unusual reduction or other special treatment.

CHECKING THE ENTIRE REPORT to make certain that final copy has been prepared for all pages, including all special pages (the cover, security page, contents page, etc.) that are used.

Reviewing Finished Copy

Always proofread all material prepared in any stage of the production of a report. Errors and omissions can occur whenever text and tables are retyped or chart sketches redrawn. Unless immediately discovered and corrected, they will probably be repeated in the next stage and may not be detected.

A final review of the entire report should be made after all related material has been prepared and assembled for reproduction. Although no rules can be definitely established to insure that an adequate review will be made, since this is dependent largely on a thorough knowledge of the subject matter, nevertheless, certain specific checks are highly desirable.

CHECKS FOR COMPLETENESS. Is all information listed in the "Contents" actually included in the report, and vice-versa? Are page numbers and running heads affixed to applicable pages? Are all chart and table titles, and necessary labels, and all other details included? (In the various stages of processing not only such details, but even whole sentences may occasionally be omitted.)

CHECKS FOR ACCURACY within text, tables, and charts. For example, is all spelling correct? Do percentages in the tables add to 100 and are chart values correctly plotted?

CHECKS FOR CONSISTENCY among text, tables, and charts. Do figures relating to the same subject matter agree? Does material in one part of the report seem to contradict or invalidate material in another part?

CHECKS FOR UNIFORMITY of treatment. Is all text appropriately typed and underlined? Are all tables properly typed and ruled? Are similar charts or tables treated similarly as to their titles and other details?

Preparing a Final Dummy

After the final copy has been assembled and reviewed for accuracy and completeness, and the last-minute changes have been made, the report is then ready to be sent to the reproduction unit. A dummy should accompany the material to indicate the order of the parts, the pagination (with a separate page in the dummy for each numbered, unnumbered, and blank page in the report), and the location of each insert chart or table. The dummy shows where each component of the report is to be placed and it is a guide to proper assembly of the printed report.

PROOFREADING

Checking text, tables, and charts for errors is one of the most tedious but more important chores in statistical presentation. Even a small harmless error is bad, because it raises doubts in the reader's mind about the entire job. Some of the most serious mistakes have survived several earnest proofreadings. A few samples of errors that might occur are shown in the paragraphs below:

"Construction in March decreased almost 150 percent." (One decimal place too many: should have been "15 percent.")

"It is the opinion of this Committee that the proposed schedule can be met." (Should have been "cannot.")

"Both manufacturers have stated that they won't convert their plants before the end of the year." (Stenographer misread her shorthand: should have been "want to".)

One reason why mistakes like these get by is that many reports must be done too quickly. Everything about these jobs is pushed through with such haste that many errors are made and some are not caught. Some things can be hurried, but proofreading is not one of them.

The main reason why errors slip through is that most of us see what we expect to see. We read words, and even groups of words, by scanning them quickly. We expect certain combinations of letters and words, and we can see them whether they are there or not.

The more familiar we are with the subject written about, the more we see what we expect; therefore, a writer is usually the worst proofreader of his own writing. Some writers have trained themselves to do this job well, but they are the exceptions.

Catching Errors

There is no foolproof method of finding mistakes, but a good way to find most of them is to use a system - make proofreading and checking a methodical procedure:

1. Split the proofreading job. Most of us lack the training and skill to do this job all alone - especially if there is a lot of it. The best way is to divide the work: have two persons "read back" the text and tables; and have others machine-check the tables, review charts, and look for particular kinds of errors.

2. Check for one thing at a time. It is easier to find mistakes if you look for one kind first and then for another. This may take longer but it is safer.

3. Have one check made by a "stranger." Someone who does not plan or write the material may pick up mistakes that the writer may miss.

4. Make sure each proofreader knows what he is supposed to check. Unless each knows what pages to check and what to look for, some things may be checked twice; some not at all.

5. Make sure that everyone initials what he has checked. This shows which pages have and have not been proofread.

These five rules for checking may seem like too many. They may be in some cases. Like all rules, they must be applied with judgment: for a short report a simpler one-man system may work well; for a long report only two or three people may be available for the proofreading job. When there is a large amount of checking to be done, however, and sufficient personnel to do it, this method is effective.

Reading Back

The best way to check typed (or drafted) material is to read it back with someone else. One person reads aloud from the original copy (long hand or preliminary typing); the other scans the proof (the next preliminary typing or the final typing, depending on the processing stage) to see that it agrees with the reader's words.

Two people working as a team are likely to catch errors they would miss if checking separately. This method lets each person fix his attention on one sheet of paper instead of reading back and forth between two. Also, some errors are more noticeable when words and figures are spoken than when they are read silently.

Marking Copy for Changes

All Typing (or printing) must be proofread to detect errors - those made by the author as well as the typist.

These errors can be in spelling, punctuation, omission of words, capitalization, alignment, spacing, or any of the other details of putting typewritten words or figures on paper.

Marking errors or changes clearly and correctly is an important part of proofreading and editing. Poorly marked-up copy leads to more errors, more work and more time lost. Always use light blue pencil on final copy, because blue does not photograph (with most film).

Proofreaders' Marks. These are symbols indicating specific types of errors or changes. They are easy for a typist to learn and follow.

The most important proofreaders' marks are explained in the list on the next page. They are standard marks used in printing and publishing (except for a few changes to fit typewriting problems that differ from typesetting problems).

Using Proofreaders' Marks. There are two systematic methods of correcting proof - by putting the corrections on or between the lines of type directly at the point of error, and by marking the errors in both the text and the margin. The first usually works well in double-spaced copy, but seldom is practicable in single-spaced copy because of insufficient room between the lines for corrections. The second is applicable under either condition, and is especially suitable in single-spaced copy because it requires a minimum of marking in the text.

The examples below show the application of proofmarking procedures under each method. When corrections are made at the point of error only, standard marks may be modified where necessary in order to improve clarity (as shown in the first example).

EXAMPLE OF COPY CORRECTED ON OR BETWEEN THE LINES:

Example 1

¶ This method may be followed when the typewriter lines are double-spaced. ~~one line apart,~~ otherwise, the exemplified method below should be used in marking errors. ¶ Regardless of the method used, one important rule should be observed ~~by you~~ always.

This rule is: ~~that~~ all changes (or corrections) should be above or on the line ~~to which~~ they refer to. The typist's copyholder hides the "copy" and corrections below.

EXAMPLE 1 (As Corrected)

This method may be followed when the typewriter lines are double-spaced. Otherwise, the method exemplified below should be used in marking errors.

Regardless of the method used, one important rule always should be observed. This rule is: all changes (or corrections) should be on or above the line they refer to. The typist's copyholder hides the copy and corrections below.

EXAMPLES OF COPY CORRECTED IN THE TEXT AND IN THE MARGIN:

EXAMPLE NO. 2

In this method, the errors ~~that are~~ indicated in the text are explained by the proofreaders' marks on the margin, as contrasted ~~with~~ the method shown in Example 1 above, it has a general rather than a limited usage. When there is more than one mark on a line of text, the marks and corrections in the margin are entered in ~~precisely~~ the same order in which the errors occur.

The marginal marks are separated each from ~~the~~ other by slash lines.

EXAMPLE 2 (As Corrected)

In this method, the errors indicated in the text are explained by the proofreaders' marks in the margin. As contrasted with the method shown in Example 1 above, it has a general rather than a limited usage.

When there is more than one mark on a line of text, the marks and corrections in the margin are entered in exactly the same order in which the errors occur. The marginal marks are separated from each other by slash lines.

EXAMPLE 3

Both margins may be used for proofreaders' ~~margins~~ when a page contains a one-column arrangement of text. Each mark should appear in the margin which is closest to the corresponding error. This procedure is especially good ~~in situations where~~ there are many errors to be corrected. It affords twice as much marginal space for corrections. At times, even this is scarcely enough.

STANDARD PROOFREADERS' MARKS

This Proofreaders' Mark	Means:	Mark in the Margin	Mark the Typing Like This:
ꝺ	Take out letter(s), word(s), or punctuation mark(s) indicated . . .	ꝺ	He marked the proofof. He marked the ~~the~~ proof. He marked/ the proof.
⁀ꝺ‿	Delete and close up space	⁀ꝺ‿	Some£one marked the proof.
⁀	Close up space	⁀	He mar⁀ked the proof.
∧	Insert letter(s) or word(s) as indicated	ν marked the	He maked the proof. He∧proof.
—	Change word(s) as indicated	the	He marked ~~an~~ proof.
/	Change letter(s) as indicated	a	He m/rked the proof.
#	Insert typewriter space(s) or line(s) where indicated	# 2#	> He marked the∧proof. Standard marks were used.
⊙	Insert period where indicated	⊙	He marked the proof∧
∧	Insert comma where indicated	∧	Yes∧he marked the proof.
∨	Insert apostrophe where indicated . .	∨	He used proofreaders∨marks.
∨/∨	Insert quotation marks where indicated	∨/∨	He said,∨Mark the proof.∨
(/)	Insert parentheses where indicated . .	(/)	He marked 15∧or more∧pages.
=	Insert hyphen where indicated	/=/	The copy is self∧explanatory.
lc	Use lower-case for letter(s) indicated	lc	He Marked the proof.
init	Use initial capitals for word(s) circled	init	marking proofs
tr	Transpose or transfer letters or words indicated	tr	He proof the marked. He the marked proof. He marked the proof. He marked the proof always.
caps	Replace with a capital the letter(s) indicated	caps	he marked the proof.
stet	Let it stand as it was. Disregard changes above the dots	stet	He ~~marked~~ the proof.
] [	Move to right (]) or left ([) as indicated	]	He]marked the proof.
⌐ ⌙	Move up (⌐) or down (⌙) to the point indicated	⌐	He marked the proof.
○	Spell out the number(s) or abbreviation(s) marked with a circle . .	spell out	He marked the 2nd proof-
¶	Start a new paragraph as indicated . .	¶ ꝺ	reading. [The reader marked ~~marked~~ the proof.
no ¶	Should not be a separate paragraph . .	no ¶	The proof was read by
?	Query. Word, spelling, etc. in doubt	?	He proof-marked the copy.

Proofreaders should always be on the alert to avoid two possible pitfalls:

1. Words that sound the same but are not spelled the same.
2. Details that cannot be read, such as alignment, spacing, and other layout features.

The English language has many homonyms - words that have the same sound but different meanings, such as: coarse/course, principle/principal, capital/capitol, etc. The meaning of the sentence usually shows which spelling is the right one; but proofreaders are concentrating on words, not thoughts. Typists and other clerical proofreaders should not be expected to think through all of the sentences. This is especially true when the volume of checking is large and when it has to be done quickly.

When reading proof with another person, either spell out homonyms or emphasize the key letter. For example, "principal with an a", or "capitol with an o", etc. When reading proper names, make it clear whenever the spelling is not the most common one: "Thomson - without a p", "Andersen with an e", etc.

Spacing and other non-readable features of the copy are harder to check by the reading-back method. The reader can note a new paragraph, a word in all caps., or an underline easily. It is harder to note and explain proper indention, spacing between lines, or centering of captions. It is generally better to have these checked by one person who knows how they should be done and can make separate checks for these design details. If all typing and drafting is done on typing layout sheets, these layout details are easier to read back and check.

Safety Rules for Reading Back. Always read from the original draft to the proof. This will increase the probability of finding errors.

FOR THE READER: Read in a clear, audible voice. Call out every punctuation mark, capital, underline, paragraph, and all other typographic or style features of the original copy.

FOR THE LISTENER: Take nothing for granted; remember that the burden of proof is on you. Follow the reader's voice closely; do not read ahead of it. Be sure to listen to every word. Mention anything that appears on your proof that the reader does not read.

Machine Checking.

Besides reading back the words and figures, all totals and calculations in a table should be checked on adding or calculating machines as an added insurance against mistakes. Derived figures, such as averages, percentages, and rates, should be recalculated.

Totals should be checked by adding their subordinate figures. If a total is divided into subtotals, each subtotal should equal the sum of its subordinate figures, and the total should equal the sum of the subtotals. When the figures are additive both horizontally (across the rows) and vertically (down the columns), they should be verified both ways.

It is best to machine check a table in each stage of preparation from worksheet through all intermediate typings to final copy, though this is not always possible due to quantity of work and time limitations. At minimum, a table should be machine checked from the original worksheet (preferably by someone other than the person who made the computations), and from the final copy.

CHAPTER 7
DISPLAY PRESENTATION

In this manual, large charts that are intended to be seen beyond the normal reading distance are called display charts. This general term is used to cover briefing charts, wall charts, easel charts, flip charts, conference charts, and lecture charts. Whatever they are called, and however they are shown - as large drawings, blow ups of small drawings, or as projections on a screen - they provide an image large enough to be seen by a group of people.

REFERENCE CHECK LIST

Before starting to prepare displays, become familiar with these topics:

Graphic Presentation	Page
Chart Types	46
Planning and Designing Charts	66
Shading	94
Tabular Presentation	
Basic Tabular Arrangements	13
Component Parts of a Table	19
Space Requirements	39

Display Presentation is a Specialty

The first thing to know about display presentation is that it is not easy to do well. The suggestions in this chapter will help, but display presentation is an art in itself which is acquired by experience.

A good display chart cannot be made by merely enlarging a report chart, because the requirements are not the same. Displays should be bolder and simpler because the reader cannot bring a display up nearer to his eyes for close examination and he usually is not able to study it long.

Selectivity - the First Key to Effective Display

In all statistical presentation there is a tendency to show too much. This is bad enough in a written report but it is worse in an oral report. On a printed page, the reader can skip some of the material, choosing the things that he wants to study. In an oral presentation the reader must look at everything. Most readers are able to absorb and retain only a limited number of visual messages. If they are presented with too much material at one sitting, they must ignore some of it.

Therefore, the first rule of display presentation is to show only the highlights. Make a picture of only the principal things the audience should learn from the presentation. Explain the "why" and the "how" orally.

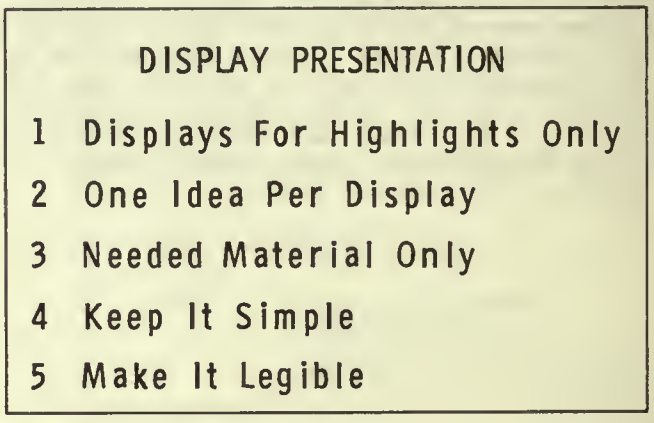
Most viewers are able to grasp only one idea at a time. Usually one major idea in a display is enough. Some secondary information can be presented but the typical viewer will get the basic idea quicker and more certainly if the presentation is focused on only one thing.

Most viewers are able to follow only a limited amount of detail. In presenting an idea, include only material that is needed. Information added as a matter of interest detracts from the basic idea even though directly related to it.

Usually the viewer is given only a limited time to study each display, therefore it must be understood quickly. It is important to keep the presentation as simple as possible. This means simplifying terms and concepts so that they may be grasped at first reading. It also means reducing all elements, such as titles, labels and scales to their simplest form.

Size - the Second Key to Effective Display

A display is almost useless if the audience cannot read it. Since the viewer cannot examine it closely, the designer must be especially careful to make everything large and bold enough to be legible at a glance. This means that the entire display should be easily readable by the farthest person in the audience. This usually requires making lettering and lines much larger and heavier than seems necessary to the person designing the displays.


DISPLAY PRESENTATION
1 Displays For Highlights Only
2 One Idea Per Display
3 Needed Material Only
4 Keep It Simple
5 Make It Legible

Good display presentation. Poor

RULES FOR USING DISPLAY PRESENTATION

1. Use display material only for the highlights or key points in the presentation.
2. Show only one idea or concept on each individual display.
3. Include only material that is actually needed to understand the display.
4. Keep the words and concepts as simple as possible.
5. Follow standards for getting at least minimum legibility.

One or more of these rules must be broken occasionally, but if they are not followed, the display will always be less effective. The effectiveness of display presentation is directly related to how closely these few but important rules are followed.

DISPLAY METHODS

Display presentation can be divided into two basic methods: displays projected on screens and those drawn, painted, or otherwise prepared as posters.

Both basic methods may be subdivided into two major types:

Projection Displays:

1. Transparent projections: using a transparent film or slide (usually made by a diazo process or by photographing the original material).
2. Opaque projections: using any small opaque original.

Poster Displays:

1. Big original displays: drawn the size they are to be shown.
2. Blowup displays: drawn small and then "blown up" to an enlarged photographic print.

Changes in facilities, equipment, supplies, and techniques have been introduced rapidly in recent years. It is desirable, therefore, for personnel responsible for statistical presentations to obtain the latest information on capabilities, characteristics and limitations from local personnel responsible for the preparation and projection of displays and to inquire about new developments from time to time.

This manual does not discuss specialized display methods such as magnet boards (the metal boards to which display material is fastened by small magnets) or flannel boards (velvet covered boards to which display material - with a sandpaper or "flock" backing - is held by friction). These are in general not suitable for statistical presentation. Ordinary chalk boards such as blackboards or green boards are not discussed separately because they are generally used to present broad concepts, outlines, and other non-statistical material. Moving-picture projection is not discussed because it is a large subject almost entirely out of the field of statistical presentation.

CHOOSING BETWEEN PROJECTIONS AND POSTERS

Many factors must be considered before deciding which of the display methods to use and no general rule will hold in all cases.

The choice of method will depend partly on the nature of the presentation, partly on the occasion, and partly on the size and characteristics of the audience. The kind of equipment and facilities available may greatly influence the choice of method.

In recent years various types of projection display have been used with increasing frequency for oral briefings. This growth has resulted in large part from improvements in equipment used in preparing material for such presentations.

BRIEF SUMMARY OF PROJECTION METHODS

Type of Projector and Transparency Size	Major Advantages	Major Disadvantages	Lighting Conditions
Slide 2" x 2"	Lightweight, small. Slides inexpensive.	Requires high degree of skill.	Semi-darkened room needed for good results.
2 3/4" x 2 3/4"	Provides slides of more workable size.	Equipment for making and showing not as widely available as the other slide sizes.	Same as for 2" x 2".
3 1/4" x 4"	Widely available standard size in many organizations.	Limited to horizontal displays (if full slide area is used). Slides are heavy and bulky (in quantity).	Same as for 2" x 2".
Overhead a/ 7" x 7", 8" x 10" or 10" x 10"	May be operated by speaker, who faces audience. Uses transparencies large enough to write on.	Transparencies are bulky (in quantity).	Satisfactory with average room lighting; better with lighting dimmed.
Opaque (Reflector Type) Up to 10" x 10" b/	No slides or transparencies needed.	Image not as clear as others because of light loss.	Darkened room needed for bright screen image.

a/ Other sizes include: 4 1/2" x 4 1/2", 6 1/2" x 6 1/2", 7 1/2" x 10" and 13 3/4" x 18 1/4".
b/ Size of material to be projected.

Projections can be shown effectively either to large or small groups when appropriate equipment, facilities, and space are available. Films and slides are generally easier to handle, transport, and store than posters. These factors are especially important when the material has a security classification.

Poster-type displays are often better when frequent reference to the material is desired. Poster displays are also useful for public exhibits that will be shown continuously for days or weeks. They may be hung on walls singly or in groups. In fact, an entire series of charts can be hung around a room (often called a "chart room") or placed on sliding display panels, so that it is easy to make comparisons from one chart to another.

Charts that can be rolled up are used extensively for oral presentations that are repeated many times to small groups at different locations and under unpredictable conditions.

A speaker's notes may be written on poster displays in light blue pencil. These can either cover supplemental information, such as numerical values of high and low points, or an outline of the entire presentation. Overlays may be used in certain poster displays.

Sometimes speakers make their own display charts and illustrations as they present their oral analyses. This may be done by using large blank pads on easels and either crayons or wick-type ink markers. "Bleeding" onto the page below may be avoided by placing a sheet of acetate above it.

PROJECTION DISPLAYS

Three different methods may be used to make projections and it is important to know the type for which the displays are being made. An original designed for one type of projection may not be good for another. For example, overlays may be used in addition to the basic chart for transparencies. Opaque curves, bars, etc., are frequently placed on transparent plastic sheets that are hinged to the basic illustration. This technique can seldom be used with slides.

Basic slide or transparency sizes are discussed below. Originals intended for one size may not be nearly as good for the others. Each size has its merits and its weaknesses. Some of these are related to how large or how small the slide is, some to the type of projector used.

Slide Projectors. Most Army installations have facilities for projecting three sizes of slide: 2" x 2", 2 3/4" x 2 3/4", and 3 1/4" x 4". A projector designed primarily for a large size can be used to project a smaller size by using interchangeable slide carriers for the smaller size. Projectors designed primarily for the small size can often be used for larger slides if appropriate changes are made in the lenses as well as the slide carriers.

The larger slides and overhead projectors are frequently used for large audiences (over 100). The smaller slides and opaque projectors may also be used if the room and the screen, lenses, and other equipment are designed to produce legible images.

The 2" x 2" slide requires comparatively little space when being carried or stored. Since it is square, it works equally well in the projector for showing either a horizontal or vertical display. But this slide is so small that it requires the highest grade of photographic skill, especially if paster-shadows or other marks must be taken out on the negative. It is almost impossible to hand-color slides this size; but they are the least costly when using color photography since they can be made from standard 35 millimeter color film.

The larger 2 3/4" x 2 3/4" slide is easier to work with than the 2" x 2" and the 2 1/4" x 2 1/4" image that it uses is easily taken with a reflex type camera, (i.e., it is easier to get a sharp focus on the ground glass of a reflex camera than it is through the common types of viewfinders on other cameras). The standard mask for this slide is square, but masks can be made to fit both horizontal and vertical displays.

The 3 1/4" x 4" size is the standard in many technical fields. Some libraries have accumulated slides of this size over many years. The good and bad points of this size are midway between those of the smaller and larger sizes. The main advantage is that this is a long-established size for which equipment is widely available. The main disadvantage is its horizontal shape, which limits displays to this shape. (A vertical shape can be used, but it wastes much of the projection area.)

Overhead Projectors. These are generally used to project large film transparencies that are placed on top of the machine. (Overlays can be used to develop a topic one step at a time.) Light is reflected through the transparencies to an overhead mirror which deflects it to the screen. Standard sizes for these transparencies are 7" x 7", 8" x 10", or 10" x 10". The most frequently used size is the one usually referred to as the 8" x 10", although the usable image surface generally measures about 7" x 9".

A great variety of overhead projectors has been developed during recent years. Most of them are designed for use with small groups but some are equipped with lenses having long focal lengths. These may be used successfully in auditoriums seating several hundred people, if the screen is sufficiently large.

Most of these projectors are portable, but many are permanently installed in rooms designed for briefings or for giving special instructions. Some are located in projection booths.

Some may be placed beside or in front of the speaker and they project the image to a reflecting screen behind the speaker at the front of the room. This is known as a front projection. It permits the speaker to face the audience instead of the screen. He can draw or write on the film. If desired, the speaker's notes may be written on the film mounts.

Some speakers do not like to operate a projector. If a projector operator is used it is necessary to establish a system of communication from speaker to operator and it is embarrassing if the system goes wrong.

Other projectors are located at the front of the room behind the speaker and they project the images toward the audience to the back side of a translucent screen. This is known as a rear projection and it is less common than the other reflecting type. If overlays are to be used for both front and rear projection they should be hinged at the edge of the frame.

The advantages of overhead projectors include the following: a large image at a short screen distance; the speaker faces the audience instead of the screen; the transparencies are large enough for the speaker to read easily; the speaker can draw or write on the film during the projection; the images are bright enough to read in semi-dark or lighted rooms; and overlays can be used to develop a topic a step at a time.

The disadvantages are that the transparencies are relatively bulky if used in large numbers. This can result in a troublesome problem if they have a security classification and must be transported by air. The portable projectors usually are carried on a cart, which is no problem unless the projector must be moved up or down stairs or from one building to another.

Opaque Projectors. These project reflected images of any non-transparent material that is printed, typed, drawn or written. The larger models take material up to 10" x 10".

The advantages of opaque projectors are that they do not require slides; can project any material that is on hand; and they are especially good when no copies of the original material are required.

The disadvantages are that: the images are not as clear or bright (with the same size lamp) as transparent projections because of light loss they must be viewed in rooms that are at least semi-darkened; the heat of the lamps can scorch originals; wax adhesives tend to melt, stain, and fall from the copy after it is removed from the projector; and they cannot be used for rear screen projection.

Two or more projectors are provided in some briefing rooms. One projector may be used for a basic image on one screen and a second may be used for a supplemental image on a second screen. Two or more projectors may also be used to show first a basic image and then a supplemental one on the same screen simultaneously.

Both uses of more than one projector produce the same end effect as an overlay, but with less change-over time and without the confusion necessitated by bringing the overlay transparency into position. A change in the content of the basic image, however, requires changes in each of the transparencies on which it appears.

When more than one projector is used, each projector usually requires a separate operator.

Production Hints for Projection Displays. Useful information concerning the preparation and projection of transparencies may be obtained from manuals and catalogs prepared by the manufacturers and some distributors of projection supplies and equipment.

Positive slides (3 1/4" x 4" or larger) can be brought up to date (by extending curves, adding simple bars, etc.) with a special ink. They cannot, however, be revised by removing any of the existing image. Negative slides cannot be brought up to date, but can be altered by painting out parts to be removed. Changes of this type can be made more easily on the larger sizes (7" x 7", and 10" x 10").

Cautions When Using Projection

1. Before preparing slides it is desirable to find out how large and what shape the screen will be. If the screen is small, try to make the slide material simpler and larger to compensate. If the screen shape is wider than it is high, try to avoid narrow charts because they will use only about half the screen area.

2. If the audience is spread out, use a matte-finish screen, not a beaded one. The beaded surface is brighter for the people directly in front of it, but not so good for those at the sides.

3. If the projector points up at the screen at a sharp angle, tilt the screen forward, if possible, to place it at right angles to the projector. Otherwise the image on the screen will have a "keystone" distortion: that is, the top will be much wider than the bottom. 1/

4. It is important to know what room lighting will be used. In a room just light enough for reading or making notes, the projection lamp must be stronger than in a room that is darkened.

5. If the screen image is pale or if it lacks contrast, try to move the projector closer. Usually a smaller, bright image is better than a large washed-out one. If the machine will take a brighter lamp, that is a better solution. 2/

6. Check all materials and equipment beforehand under conditions which resemble those expected during actual presentation as closely as possible.

1/ Some manufacturers of portable screens supply devices to correct this effect. Screens that are fastened to the wall or hung from the ceiling can usually be tilted by pulling the bottom edge back or moving the top edge forward. Some are permanently installed at the angle that is the most satisfactory.

2/ It is important to check manufacturer's instructions before using a larger lamp: additional heat may damage lenses if the projector is not designed for it.

POSTER DISPLAYS

Posters are usually made on large sheets of illustration board. This has a good drawing surface and takes all kinds of ink, crayon and paint (except oils). Its erasing qualities are good.

Illustration board comes in two standard sizes: 30" x 40" and 40" x 60". A 60" x 80" size is made, but is not widely available.

The 30" x 40" size is good for fairly close viewing (10 or 12 feet). It can be used at greater distances only if the chart is so simple that the lettering can be made large. The 40" x 60" size is best for general use, but is not big enough for large audiences.

The 60" x 80" size is best for groups of 100 or more, but it is so big that it is awkward to work on and to handle. If an image larger than 40" x 60" is needed, projection of some type is usually better.

The step-at-a-time technique can be used in poster displays by hiding part of the chart with one or more sheets of white paper (lightly attached with tape or rubber cement at the top corners) and then uncovering it at the desired moment.

Production Hints for Poster Displays. Get striking "reverse" (white on black) effects by making photostat negatives of titles, or other key parts of the display and attaching them to the original. Another method is to fasten a strip of black paper to a chart, then attach white gummed letters. This is a good way to get emphasis without using color.

Photographic blowups are useful:

(1) when available personnel lack experience in making poster-type originals, but can make good small originals.

(2) when existing small size material is to be used for display.

(3) when more than one copy is needed for display.

Blowups are usually made with professional photographic enlargers. They can be made by projecting a negative film to a sheet of sensitized paper tacked to the wall, but this is an emergency make-shift method. Even if the proper enlarger is available, the large size sheets of photographic paper are not always available when needed.

Production Hint for Photographic Blowups. Wet photographic blowups before mounting so that they will dry flat and without wrinkles. Mount a sheet of Kraft paper on the back of the cardboard to prevent the blowup from curling as it dries.

For quick-mounting a blowup, make it 3 or 4 inches oversize each way; then fold this excess over the back of a piece of beaverboard and staple. The result is not as flat as it would be if the material were pasted, but it is usable.

Flop-Overs. Either big originals or blowups can be made as rigid displays or as "flop-overs". Flop-overs, sometimes called "flip sheets", or "flip charts", are flexible sheets fastened at the top with staples, cords, screw posts, or rings, or between two strips of half-round wood. After each chart is shown and discussed, the speaker or an assistant turns it up, over, and down behind the others.

Flop-overs are not as bulky as illustration board, and so are often used when a set of displays must be carried about from place to place. They have three disadvantages: If much larger than 30" x 40", they are hard to lift over; they are likely to tear; also, since the sheets are fastened in a fixed order, they are hard to use except in this order. They are satisfactory for fixed sequences of ideas (as in training aids) but are of limited use for the presentation of statistical material.

The tearing of flop-overs can be prevented by backing the paper with a sheet of mounting linen or binding the edges with a strip of transparent or white scotch tape.

Flop-overs can be made or mounted on stiff sheets if hinged at the top with flexible strips such as linen binding tape.

LETTERING FOR DISPLAYS

Display charts are more likely to have lettering that is hard to read than other charts. The reasons for this are that many designers of displays tend to:

1. Underestimate the sizes of lettering needed.

2. Space words and letters too close together.

3. Request more degrees of subordination in the size of letters than can be shown successfully with available type sizes.

4. Include more information than can be shown legibly.

A large variety of TYPE FACES is available for use in display charts. Legibility depends primarily on size and design of the type.

The size of type is generally measured in "points". A point is equivalent to about 1/72 of an inch. Point size can be approximated by measuring the distance between the top of a lower case letter with an ascender (such as an h) to the bottom of another lower case letter with a descender (such as a y).

The large variations in relative amounts of space assigned to the ascenders and descenders greatly affect the distances at which different type faces having the same number of points may be read. Wide, black letters with short ascenders and descenders and sufficient space between the letters can be read much farther than narrow, thin letters with long ascenders and descenders set close together.

RULE-OF-THUMB FOR SIZES AND DISTANCES

If you know the distance from the display to the farthest viewer, divide this distance (FEET) by 32 to get the smallest legible lettering size (INCHES). Example: distance 16 ft. ÷ 32 = .5 inches = lettering 1/2 inch high on the poster or screen.

If you know the lettering size, multiply this (INCHES) by 32 to get the farthest distance (FEET) at which it will be legible. Example: Lettering .35" high, multiplied by 32 = legible at 11 ft.

For individual type faces, however, point sizes are significant. They are useful for establishing limits on the smallest letters to be used. A limit of 14 points, for example, is generally used for 8" x 10" transparencies for projection.

It is much easier to establish standards for Wrico and Leroy lettering guides than for type faces.

The standards presented below should be regarded as guidelines that should be modified to meet the needs of specific conditions, including size of the screen or poster, its distance from the farthest viewer, type and capacity of the projector, the shape of the room and the amount of light in it.

If the originals are made small, and enlarged for presentation (by using blowup prints or screen projection) the lettering methods for making report charts may be used. The following table lists minimum lettering sizes recommended for these small-size originals:

SIZES OF SLIDE ORIGINALS AND LETTERING SIZES a/

When Viewing Conditions Are:			If Smallest Lettering Size Is: (Capitals) f/
Above Average b/	Average c/	Below Average d/	
Use this size original e/			
6 1/2"	5 1/4"	4 1/4"	.100"
7 1/2	6 1/4	5	.120
9	7 1/2	6	.140
11 1/4	9 3/8	7 1/2	.175
12 3/4	10 1/2	8 1/2	.200
15	12 1/2	10	.240
18 1/2	15 1/2	12 1/2	.290
22 1/2	18 3/4	15	.350
27	22 1/2	18	.425
32 1/2	27	21 1/2	.500

a/ This also applies to material used in opaque projectors or to originals used for blowup charts.

b/, c/, d/ Distance from viewer to screen { 6 x, 7 1/2 x, 9 x } Screen Image Size

e/ Longest dimension (not counting margins).

f/ Standard Gothic letters or equal.

Before selecting the size and face of the smallest letter in a display it is important for several people to look at samples of different sizes and faces under the most adverse viewing conditions that are anticipated.

Typewriting is a satisfactory method of lettering, especially for text and tabular displays, if the original is small enough. A good rule of thumb for material prepared on a standard typewriter is to use an original no larger than 1/2 a letter-size sheet. The originals may be larger if the less common machines with larger type are used.

When used in display work, typing should be clean, but heavy. The light, sharp typing needed for good report reproduction is generally too weak for display presentation.

Headliners also may be used, when available, for both the large and small letter sizes. The exact specifications may be obtained from retailers' catalogs.

Type stamping (with printers' type set in a large metal type holder and used like a rubber stamp) is a good method for small displays, especially when certain words or numbers are repeated; but the equipment needed is not widely available.

For big original poster-type displays, the choice is between three lettering methods: large size lettering guides, paste-on letters, or free-hand lettering. Tracing stencils (letters inked and filled in free-hand) are a good last resort when other methods are not available.

PASTE-ON LETTERS are available either with or without a gummed back. These letters take more time than lettering guides but they provide large, bold lettering and do not require waiting time for work to dry.

LETTERS PRINTED ON CARD STOCK generally may be fitted (face down) into a composing stick, fastened in a strip with a piece of double adhesive tape which is then turned over and pressed into position on the display.

This is a fairly quick lettering method but usually is not suitable for displays to be shown in original, for each letter card shows a shadow that gives the display a patched-up appearance.

LETTERS PRINTED ON TRANSPARENT ADHESIVE-BACK FILM are cut from the sheet and placed directly on the display, one at a time. They are applied easily, but this is a fairly slow method. These printed letters are thinner than cardboard letters and so cast no shadow; but they do reflect light that can be objectionable on a display viewed in original.

WRICO AND LEROY LETTERING GUIDES may be used for display lettering. The table at the top of the following page lists recommended minimum sizes of poster letters (or screen images) for various distances. These sizes are for the regular "Gothic" letter style. The largest Wrico guide is 2 1/2" high and the largest Leroy guide is 2" high.

The key to legibility is the size of the material in the display, not the overall size of the poster. A smaller display should use the same size lettering and line weights as a larger display unless it is to be seen at a closer range.

MINIMUM LETTERING SIZES FOR POSTER DISPLAYS a/

LEROY b/			Distance - Display to Farthest Viewer (Feet) e/	WRICO c/		
Guide No.	Letter Height	Pen d/		Guide No.	Letter Height	Pen d/
350	.350"	4	10-11	35	.350"	3
--	--	--	11-12	40	.400	A
425	.425	5	12-15	--	--	--
500	.500	6	15-18	50	.500	A
--	--	--	18-21	60	.600	B
700	.700	9	21-23	--	--	--
--	--	--	23-25	75	.750	C
1000	1.000	10	30-35	100	1.000	C
--	--	--	35-40	125	1.250	D
1350	1.350	12	40-45	--	--	--
--	--	--	45-50	150	1.500	D
--	--	--	55-60	185	1.850	E
2000	2.000	14	60-70	--	--	--
--	--	--	70-85	250	2.500	E

NOTE: These standards apply also to other lettering methods, such as headliners, gummed letters, or free-hand lettering of equal size and the same style.
a/ Displays to be viewed in original size or images on a screen.
b/ Scriber type guides.
c/ Stencil type guides (manufacturer also makes scriber type guides up to .625").
d/ Numbered sizes are tubular type; lettered sizes are "brush" type pens.
e/ Recommended maximum for good viewing conditions. If lighting, seating, etc., are poorer than average, decrease these distances by 1/3 or increase lettering size by 1/2.

Style of Lettering. The best practice is to use the simplest and most legible style of letters. Standard lettering guides make "block" letters with all strokes the same thickness and with no serifs. This style is recommended for most display work because it is easy to read and easy to draw.

The particular alphabet used in standard Leroy and Wrico lettering guides is "engineering Gothic". All the capital letters except the "I" are about the same width: (about 3/4 the letter height).

Displays that are all lettering are usually easier to read in a lettering style that uses both thick and thin strokes and serifs.

Distinctive styles are sometimes effective for main titles (if the title is short and the style is legible).

CONDENSED LETTERS (less than half as wide as high) are not recommended for standard use because they are less legible than normal width letters. Larger condensed lettering, however, can be more legible than smaller non-condensed lettering that takes the same space from left to right. For this reason long titles that cannot be shortened should have condensed letters.

Caution: If condensed letters are made too bold (thick stroke) they seem to "fill in" at a distance and are hard to read.

CAPITAL LETTERS are the standard for display charts and most tables. Long notes or subtitles, however, (especially those that take two or more lines) are usually more legible in lower case. Text displays are lettered in all capitals if they are very brief. If the text is more than 25 words long, use capitals for the title and lower case for sentences and paragraphs.

SHADING DISPLAYS

The principles to follow in shading displays are the same as for any other graphic presentation.

Small originals (to be used for blowups or projection) can be shaded with the same materials that are used for report charts. Shadings for large original displays must be considerably coarser.

Patterns must be big and bold on the large charts to make them easy to distinguish at a distance, and especially if the large charts are to be greatly reduced in order to make small hand-out copies or record copies.

The shading patterns shown in the last column of page 96 will be satisfactory for charts no larger than 40" x 60". These may be reduced in order to bring them down to letter-size copies. These patterns may be supplemented by open (white) and solid (black or a dark color).

RULES FOR LEGIBLE DISPLAY LETTERING

1. Use a simple letter style. Block (uniform line weight with no serifs) is usually best.
2. Use standard letter proportions (letters averaging about 3/4 as wide as high). As a standard practice, condensed letters should be avoided.
3. Make lettering contrast sharply with the background. Use black lettering on white; white lettering on black. Grey lettering must be much larger than black or white to be equally legible. (Follow the same "contrast" principle when using color.)
4. Be sure letters are large enough. (See tables of minimum lettering sizes.) Few objections will occur if lettering is too large - many, if it is too small.
5. Space letters properly. Keep white space (not distance) between letters approximately equal, and large enough to prevent them from "running together" when viewed.

As explained previously, black and white should be reserved for shading only the smallest areas. Colored shading is available (sometimes on special order) in several coarser patterns, and is effective for display presentation. It is important to use a different pattern for each color if black and white copies are to be made.*

If no copies are needed, color may be substituted for shading; but this is even more difficult than shading, especially when several different areas or items must be identified.

Another shading method, especially useful for charts larger than 40" x 60", is to "shade" areas with strips of cellophane tape. In this method, the part to be shaded may be colored first (with colored paper, colored film, paint, or some other pigment). Colors that will reproduce white are then striped with narrow strips of dark cellophane tape; colors that will reproduce black are striped with white tape. Tapes in various colors also may be used.

Tapes are available in widths 1/32 of an inch and up. Tape that is 1/16" or 1/8" wide is easier to handle than 1/32" and reproduces much better in small black and white copies. The stripes are usually about an inch or more apart. Crosshatching can be made by adding a second set of stripes at right angles to the first. All of the shading lines should be at a 45 degree angle.

This line-at-a-time method of shading is effective for two reasons: it permits the use of color, but helps to remove the need for many different colors on the same chart. For example, blue could be used for three different areas: one solid, one crisscrossed with white hatching, and one crossed with diagonal white lines. However, this shading method is fairly slow and painstaking, and should not be used if standard shading sheets are available.

COLOR IN DISPLAYS

Display charts are well suited to the use of color. Color costs relatively little if displays are made in one copy only, and color can help tell the story quickly and clearly.

Two basic rules for using color in displays are:

1. Make the color do some work. Do not use it without purpose.
2. Use it in such a way that relationships are clear if displays are reproduced in black and white.

Unless the first rule is followed, poor displays can easily result. Applied only to make a more vivid chart, color can do more harm than good by placing the emphasis in the wrong place or by making the display harder to understand, rather than easier.

* Shading film usually comes with the glossy surface face up. This produces a bad glare that is undesirable on display charts to be viewed in the original. Some sheets are printed with the matte (dull) side up. These are much better for display purposes.

Some typical ways to make color work effectively are to:

1. Use light tones of subdued colors (such as blue or green) to deemphasize secondary or background data such as earlier estimates, etc. Use bright colors (such as red or orange) to emphasize primary important relationships, key items, etc.

2. Try to standardize on certain colors for specific purposes of meanings in a series of similar or related charts. For example, red is often used for program and bright blue for program accomplishment.

The rule to apply color in a way that will make understandable black and white copies does not always apply, but it is generally desirable to code colored curves or areas by using a different pattern for each color (including black). Tapes and films in display sizes are available commercially in many patterns and colors. See also "Selecting Curve Patterns" and "Shading"; in the graphic presentation chapter.

When using color in displays, it is important not to use too much of it.

COLORING METHODS can be summarized only briefly in this manual. They can be divided into three basic groups:

1. Pencils, crayons, pastels.

2. Inks and paints.

3. Colored papers, adhesive tapes and films.

The first group seldom provides the best method. Pencil or crayon color is hard to put on evenly, and pastels are messy. "Builders" crayons that are one-half inch thick, however, are useful for making some types of quick, emergency displays.

Inks. For poster displays, opaque or pigment inks give clearer, more even color than the transparent inks. For coloring glass slides or films, however, inks must be as transparent as possible.

Paints. Water colors (opaque, transparent and tempera) have been used for display presentation for many years. A newer substance, however, acrylic-vinyl copolymer, has been gaining in popularity and has been replacing rubber-base paints.

Oil paints (either artists' or decorators') are not recommended.

Colored Papers. These are good for large areas, because they provide flat, even colors. They are not self-adhesive, so must be pasted on (usually with rubber cement). Several grades are available. For most display uses, sheets that are printed or coated with color are better than those color-dyed during manufacture. They are usually available in larger sheets and in a better variety of colors. Colored papers, however, stain easily and must be handled carefully when posting.

Self Sticking Tapes. These are coated on the underside with a "pressure" adhesive. They are excellent for making colored lines or bars, and even for shading large areas.

Tapes are often used in making transparency masters or originals as well as for posters. The narrower tapes can be used as rules. Caution should be exercised in using narrow colored tapes that are to be photographed, because they tend to darken to the extent that colors cannot be distinguished.

Tapes are available in polyester film and in cellophane, vinyl, and plastic coated cloth. The relatively new polyester film is more tough and more resistant to moisture, chemicals, and to temperature changes than cellophane or vinyl tapes. They are also more stable and do not shrink, even when attached for long periods of time.

Most cellophane tapes have a shiny finish that may reflect a troublesome glare, especially when used to cover large areas. Glare can be eliminated by using tapes with a matte finish.

Adhesive Film Sheets. These come in two principal types: those having a wax backing that adheres when the film is pressed down with a burnisher, or a tacky adhesive (non-melting) backing that adheres with light pressure. Many matte finished sheets which do not reflect light are available.

Some tapes have color only on the surface. These are generally used when it is desired to rub some or part of the color off for art work separation. Tapes with color not limited to the surface do not need to be handled as carefully as the others.

The polyester film discussed in the preceding section on tapes is also available in sheets. These film sheets have the same characteristics as the tapes and they are widely used in making transparencies for overhead projection.

HINTS FOR ORAL PRESENTATIONS

1. Determine when displays will be visible. Indicate exactly in text when the displays and any overlays are to be shown the audience and when they are to be withdrawn. They should be on long enough to be read, but not so long as to cause loss of interest.

2. Select times when the speaker will be silent. The audience should have a chance to study new and complex displays.

3. Determine what lights will be used. It is also important to determine when to use each light.

4. Determine who will do the pointing. If it is to be someone other than the speaker, instruct him thoroughly so that there will be no communication failures.

5. Select the best pointing method. Many different devices, including electrical pointers, are available to call attention to highlights.

6. Determine when the pointing is to be done. Many presentations are impaired by too much or too little pointing.

7. Determine what equipment will be used. This means what specific type and size of projector, screen, easel, and lights will be employed, etc.

8. Learn how to operate this equipment. Some lecterns contain remote control and other electrical equipment for dimming lights, changing slides, etc. These must be investigated thoroughly before facing an audience.

9. Determine exactly where equipment will be placed. This includes the lectern, if any, and the screen and projector or the easel. It is also important to insure that the display is high enough so that the whole audience can see all of it.

10. Rehearse all aspects of the presentation. Obtain suggestions from associates and eliminate deficiencies.

11. Inspect all equipment shortly before speaking. Make certain that everything is in proper position and in operating condition. Make plans in advance for any necessary repairs of defective microphones or other devices.

12. Do all these things before the audience appears.

LIST OF REFERENCES

The American Society of Mechanical Engineers
American Standards Time Series Charts (ASA Y15.2 - 1960), 1960.
Illustrations for Publication and Projection (ASA Y15.1 - 1959), 1959.

Arkin, Herbert and Colton, Raymond R.
Statistical Methods as Applied to Economics, Business, Psychology, Education and Biology, 4th Ed., Barnes and Noble, New York, N.Y., 1959.

Croxton, Frederic E. and Cowden, Dudley J.
Applied General Statistics, 2nd Ed., Prentice Hall, Inc., 1955.

Haemer, Kenneth W.
Making the Most of Charts. An ABC of Graphic Presentation. American Telephone and Telegraph Co., New York, N.Y., 1960.
Making Your Meaning Clear. Six Steps In Effective Communication. American Telephone and Telegraph Co., New York, N.Y., 1959.

Hanson, Kermit O.
Managerial Statistics, Prentice Hall, Inc., 1955.

Marting, Elizabeth, Editor
Reports to Top Management, American Management Association, New York, N.Y., 1953.

Mills, Frederic C.
Statistical Methods, 3rd Ed., Henry Holt and Co., New York, N.Y., 1955.

Neter, John and Wasserman, William
Fundamental Statistics for Business and Economics, 2nd Ed., Allyn and Bacon, Boston, Mass., 1961

Schmid, Calvin
Handbook of Graphic Presentation, Ronald Press, New York, N.Y., 1954.

The University of Chicago
A Manual of Style, The University of Chicago Press, Chicago, Ill., 1949.

United States Government

Bureau of the Census
Bureau of the Census Manual of Tabular Presentation, prepared by Bruce L. Jenkinson, 1949.

Department of the Army
AR 320-5, Dictionary of United States Army Terms.
AR 320-50, Military Terms, Abbreviations, and Symbols - Authorized Abbreviations and Brevity Codes, 1964.
AR 325-10, Computation of Rates.
DA Pamphlet No. 1-10, Improve Your Writing.
DA Pamphlet No. 325-5, Statistics. Federal Statistical Standards, 1965.

Joint Chiefs of Staff
Dictionary of United States Military Terms for Joint Usage, 1964.

United States Government Printing Office
Style Manual, 1959.
Word Division Supplement to Government Printing Office Style Manual, 6th Ed., 1962.

INDEX

A

Page

Abbreviations:
Boxhead 29, 30, 31
Charts 66, 82, 83, 99
Text 6
Titles 20
Accuracy 11, 121, 122, 125
Advantages of:
Charts 4, 44
Tables 4, 11
Text 4, 5
Amount scale for charts:
Breaking curves 81
Breaking the amount scale 50, 65, 80
Captions (see also Captions) 82, 88
Intervals or divisions 81
Location of 82, 88
Range 80
Uniform scales 81
Analytical:
Tables 12
Arrangement of stub 25
Arabic numerals
For tables 22
Area charts 62-63
Area vs. linear measurement 62-63
Arithmetic vs. logarithmic scales 75
Arrangements of items in stub:
Alphabetical 22
Analytical 25
Blank lines 27
Capital letters 24
Chronological 23
Customary 23
Emphasis 23, 25
Frequency 23
Geographical 23, 25
Importance 23, 25
Indention 24, 25
Items in stub 22, 28
Lengthening 26
Location 23, 25
Numerical 22
Progressive 23, 25
Quantitative 23
Shortening 27
Spacing 24
Status 25
Subordinate 23, 24, 25
Arrangements, basic tabular:
Divided stub and repeated boxhead table 15, 16
Repeated stub and divided boxhead table 17, 19
Repeated stub and single boxhead table 17, 19
Repeated stub and repeated boxhead table 18, 19
Single stub and single boxhead table 15, 16
Subtables 19
Arrows:
Actual-estimated 93
Arrows and other label pointers 98, 100-101
Preprinted 98

B

Band chart 51, 73, 105
Bar charts:
Bar-and-symbol chart 54
Breaking bars 54, 65, 88, 89
Change-bar chart 56-57
Components of 45
Designing for charts 71
Deviation-bar charts 55
Graphic symbols, use of 71
Grid proportions 78, 90
Grouped bar chart 55
Lettering sizes 102
Line weight standards 102, 104
Need for zero or base line 52, 54
One hundred percent bar chart 55
Overlapping bars 91
Paired bar chart 55
Progressive or step-by-step bar chart 57
Range-bar chart 56
Ranking of items 54, 71
Scale captions 88
Scale location 88
Scale numerals 88
Scales for 88
Simple bar chart 54
Sliding bar chart 56
Spacing bars 90-91
Spacing between lines 103
Spacing letters 103
Specification sheet 105-107
Subdivided bar chart 54
Supplementary data in the stub 71

Page

Bar charts - Continued
Two-way progressive bar chart 57
Uniform thickness of bars 54
Bar spacing 90
Bar thickness 54, 71, 90
Binding methods:
Loose leaf 115-116
Mechanical binding 115-116
Stitching or sewing 115
Blank lines, rules for:
Footnotes 8, 9, 114
Paragraphs 8
Rulings 114
Stub 27
Tables 114
Text 114
Blowups, photographic 130
Board, illustration 130
Boxhead:
Abbreviation 31
Arrangement of columns 29, 30
Capitalization 31
Columns 29, 30, 31
Construction 30
Contents 28
Location 14, 28
Punctuation 29
Spacing 29, 30
Units of measurement 31
Wording 29, 30
Breaking words 5, 10
Breaking amount scales 50, 65, 80
Breaking bars 54, 65, 88, 89
Breaking columns 52, 65, 89
Breaking curves 80
Broadside pages 13, 114-115

C

Capitalization:
Boxhead 31
Stub 24
Titles 22
Captions:
Amount-scale 45, 82, 88
Chart 99
Time-scale 83, 86, 87
Change-bar chart 56, 57
Chart captions (see also Captions):
General notes 99
Reference notes 99
Source notes 99
Subtitles 99
Titles 99
Charts 44, 107
Chart components:
Bar charts 45
Column charts 45
Curve charts 45
Chart construction:
Arrows and other label pointers 101
Breaking bars and columns 89
Chart captions 99
Chart lettering 102-103
Chart size 79
Connected columns 91
Curve patterns 46, 97
Draftsman's role in 78
Goals and projections 92, 93
Grid proportions 78
Importance of construction standards 78
Labels 100
Line weight standards 102, 104
Overlapping columns or bars 91
Plotting 82
Preprinted parts 98
Processing copy 121
Scale rulings 84-87
Scales 80-83
Selecting scales for bar charts 88
Shading 92-96
Spacing bars and columns 90
Specification sheets 105-107
Time-scale designations and rulings 86-87
Chart content and design, keep simple 66
Chart data sheets 121
Chart development. (See Development of charts from tabular data.)
Chart labels 93, 98, 100-101
Chart lettering:
Letter count for chart titles and notes 102, 103
Letter spacing 103
Lettering guides and recommended pen sizes 102
Lettering sizes for charts 102
Line spacing 103
Word spacing 103

Page

Chart selection, problems of . . . 44
Chart shape . . . 78
Chart size . . . 79
Chart sketches . . . 70
Chart specifications . . . 105-107
Chart style:
  "Decorative" style . . . 76
  Examples . . . 76, 77
  "Narrative" etyle . . . 76, 77
  "Pictorial" style . . . 76, 77
  "Poeter" etyle . . . 76, 77
  "Statistical" style . . . 76, 77
  Style for exhibite and displays . . . 76, 77
  Style for printed publications . . . 76
  Style for etatistical reporte . . . 76
  "Three-dimensional" style . . . 63, 64, 76, 77
Chart subtitlee . . . 99
Chart titles.(See Titles, chart.)
Chart types . . . 46-61
Chart width . . . 79
Charte, poor . . . 65
Checking:
  Copy . . . 121
  Machine . . . 11, 125
Ciphers . . . 32, 34
Classification labels, security . . . 110, 111, 112, 113
Color dieplay . . . 133-134
Column charts:
  Breaking columns . . . 52, 65, 89
  Components of . . . 45
  Connected columne . . . 91
  Deviation-column chart . . . 53
  Floating column chart . . . 53
  Grid proportions . . . 78
  Gross and net deviation-column chart . . . 55
  Grouped column chart . . . 52
  Lettering eizes to use . . . 102
  Line weight standards . . . 102, 104
  Overlapping columns (or bars) . . . 53, 91
  Range-column chart . . . 53
  Simple column chart . . . 52
  Spacing between lines . . . 103
  Spacing columns . . . 90, 91
  Specification sheet . . . 106
  Subdivided column chart . . . 52, 73
Column and slope-curve chart . . . 59
Column and step-curve chart . . . 59
Column, slope-curve and range chart . . . 59
Columns:
  Arrangement of . . . 29
  Boxhead . . . 29
  Figures, placement in . . . 34
  Lettered . . . 31
  Number on page . . . 113, 114
  Overlapping . . . 91
  Thickness . . . 91
Combination type charts:
  Column and elope-curve chart . . . 59
  Column and step-curve chart . . . 59
  Column, slope-curve and range chart . . . 59
  Slope and step-curve chart . . . 58
  Split-scale chart . . . 59, 84, 87
  Subdivided surface and curve chart . . . 58
  Surface and curve chart . . . 58
Commas, in figures . . . 34
Components of:
  Charts . . . 45
  Tables . . . 14, 19-38
  Field . . . 31
Computer-printed tables (and totals) . . . 42-43
Contents page . . . 108, 109, 110
Copy:
  Assembling . . . 121
  Checking . . . 121
  Marking for change . . . 123-125
  Preparing . . . 117
  Processing . . . 121
  Reviewing, finished . . . 121
Cover of report . . . 108-109
Cubes . . . 63
Cubic vs. linear measurement . . . 63
Cumulative curve chart . . . 47
Cumulative deviation chart . . . 47
Cumulative frequency chart . . . 60
Curve charts:
  Components of . . . 45
  Cumulative curve chart . . . 47
  Cumulative deviation chart . . . 47
  Curve patterns, selection of . . . 97
  Grid proportions . . . 78
  Index-scale chart . . . 49
  Lettering sizes to use . . . 102
  Line weight standards . . . 102, 104
  Logarithmic chart . . . 49, 75
  Multiple amount-scale chart . . . 48

Page

Curve charts - Continued
  Multiple-log amount-scale chart . . . 49
  Multiple elope-curve chart . . . 47
  Multiple step-curve chart . . . 47
  Multiple time-scale chart . . . 48
  Repeated time-scale chart . . . 48
  Simple curve chart . . . 46
  Simple elope-curve chart . . . 46
  Simple step-curve chart . . . 46
  Spacing between lines . . . 103
  Specification sheet . . . 105
  Supplementary amount-scale chart . . . 49
Curve patterns, selection of . . . 97
Curves, kinds of . . . 97

D

Dash . . . 32
Data changes in charts, how to show . . . 74
Data cheete for charts . . . 70
Dates:
  In report titles . . . 109
  In text . . . 6
Decimale . . . 34
"Decorative" chart style . . . 76, 77
Development of charts from tabular data:
  Deciding how to chart . . . 67
  Deciding what to chart . . . 67
  Deciding whether to chart . . . 67
  Examplee . . . 67-69
Definitions . . . 108
Designing oharts:
  Changes in content of the data . . . 74
  Chart sketches . . . 70
  Chart-style . . . 76, 77
  Check list for . . . 66
  Data sheets . . . 70
  Designing bar charts . . . 71
  Development of charte from tabular data . . . 67-69
  Insert charts . . . 72
  Keep charts simple in content and design . . . 66
  Planning charts . . . 66
  Presenting charts to the reader . . . 66
  Status-change-etatus charts . . . 74
  Subdivided surface charts . . . 73
  Typical examplee of poor presentation . . . 65
Designing effective tables . . . 11
Deviation-bar chart . . . 55
Deviation-column chart . . . 53
Deviation-curve chart . . . 51
Diagrams . . . 44
Dieplay presentation:
  Chart style for . . . 76, 77
  Poster . . . 127, 130-134
  Production hints . . . 129
  Projection . . . 127, 128-129
  Reference check list . . . 126
  Rulee . . . 126
  Selectivity . . . 126
  Size . . . 126
Distribution list, report . . . 109, 110
Dollar sign . . . 34
Double-page spread:
  Basic arrangement . . . 13, 15, 114
  Stub . . . 22
Double stub . . . 24
Dummy, report . . . 117, 122

E

Emphasis, by allocation of space on page . . . 121
Emphasis in charts . . . 44, 67
Emphasis in tables:
  In the stub . . . 22-25
  Placing figures close together . . . 12-13, 15
  Vertical and horizontal comparisons . . . 12-13
Emphasis in text:
  Headings: . . . 7-8
  How achieved . . . 5
  Key lead words . . . 8
  Underscore . . . 8
Exhibits, chart style for . . . 76

F

Faults, common:
  In report presentation . . . 2
  In statistical tables . . . 13
Field, of a table:
  Commas in figures . . . 34
  Components . . . 31
  Decimals . . . 34
  Dollar and percent signs . . . 34
  Every cell must have an entry . . . 32
  Field spanners . . . 31, 32

Page

Field, of a table - Continued
Location . . . 14
Placement of figures in the column . . . 34
Reference symbols . . . 36
Units of measurement . . . 32
Zeroes . . . 34
Figures:
Arabic for table numbers . . . 22
Commas in . . . 34
In text. (See Numbers in text.)
In titles . . . 22
Placement in column . . . 34
Film sheets . . . 134
Film display, letters on . . . 131
Floating column chart . . . 53
Flip charts or Flop-over charts . . . 130
Fold-in pages . . . 15, 42, 115
Footnotes in tables (see also Notes in charts, Footnotes in text and Notes, tabular) . . . 32, 35-37
Footnotes in text (see also Notes, tabular):
Examples, text . . . 8-9
Indention . . . 9, 109
Location . . . 8, 114
Punctuation . . . 8
Reference symbols . . . 8
Ruling for . . . 8
Spacing for . . . 8
Systems . . . 8
Foreword . . . 108, 109, 110
Forms, master . . . 120
Frequency charts:
Comparing frequency distributions . . . 60
Cumulative frequency chart . . . 60
Histogram . . . 60
Scales for . . . 83
Simple frequency charts . . . 60

G

Glossary . . . 108
Goals, objectives, performance, plans, requirements 58,59,92, 93
Graphic labels . . . 64
Graphic presentation, pros and cons of . . . 4, 44
Graphic symbols, use in bar charts . . . 71
Graphic tables:
Progress chart . . . 61
Rank chart . . . 61
Status chart . . . 61
Graphic types not recommended:
Area charts . . . 62-63
Examples of poor presentation . . . 65
Maps . . . 44-64
Perspective charts . . . 63-64
Perspective plus 3-dimensional treatment . . . 64
Pictographs . . . 64
Pie charts . . . 62
Three-dimensional charts . . . 63, 64, 76, 77
Graphics:
Kinds of . . . 44
Selecting right kind of chart . . . 44
Uses of . . . 44
Grid proportions . . . 78, 91
Grid rulings (see also Scale rulings and Time-scale designations and rulings) . . . 44-45, 84-87
Gross and net deviation-column chart . . . 53
Grouped bar chart . . . 55
Grouped column chart . . . 52
Guide, lettering . . . 102

H

Headings and subheadings in text:
Chapter . . . 7
Major subdivision . . . 7
Minor subdivision . . . 7
Minor subdivision component . . . 8
Reference symbols in . . . 36
Running heads . . . 110, 111, 112, 113
Section . . . 7
Headliners . . . 131
Headnotes . . . 34-35
Histogram . . . 60

I

Indention:
Footnotes . . . 109
Listings of items . . . 8
Paragraphs . . . 8
Stub . . . 24-27
Index report . . . 108, 109, 135
Index-scale chart . . . 49
Inks . . . 133
Insert charts . . . 72
Introduction, report . . . 108

Page

Issuing agency, name of . . . 109

J

Justifying typewritten text (for an even right margin). . . 9-10

K

Key lead words . . . 8
Keys, use of in charts . . . 100

L

Labels and label pointers (chart) . . . 93, 98, 100-101
Labels, graphics (pictographs) . . . 64
Layer chart . . . 50
Layout and organization, page . . . 113-115
Semifinished pages . . . 42-43, 114
Variety . . . 114
Layout, page, examples . . . 111, 112
Layout sheet, typing . . . 111, 112, 117, 118, 119, 120
Leaders, stub of table . . . 28
Legends, use of, in charts . . . 100
Lettering:
Boxhead . . . 29
Display . . . 130-133
Chart (see also Chart lettering) . . . 102-103
Guides . . . 102, 131, 132
Pens . . . 102-103
Sizes . . . 130-132
Spacing . . . 103
Letter of transmittal . . . 108, 109
Line numbers . . . 28, 31
Line weights:
Footnotes, text . . . 8
General standards for charts . . . 102, 104-107
Tabular rulings . . . 38
Linear vs. area measurement . . . 62-63
Linear vs. cubic measurement . . . 63
Listing of items . . . 8
Location:
Figures in column . . . 34
Figures in table . . . 12-13
Footnotes, tabular . . . 35-37
Footnotes, text . . . 8-9
Logarithmic chart . . . 49, 75

M

Maps . . . 44, 64
Master forms . . . 42, 120
Measure, units of:
Boxhead . . . 31
Field . . . 32
Multipage tables, titles . . . 22
Multiple amount-scale chart . . . 48
Multiple-log amount-scale chart (see also Logarithmic charts) 49
Multiple slope-curve chart . . . 47
Multiple step-curve chart . . . 47
Multiple time-scale chart . . . 48

N

"Narrative" chart style . . . 76, 77
Notes, explanatory, contents and coverage . . . 108
Notes, tabular (see also Footnotes in text, Footnote in tables and Notes in charts):
Body notes . . . 35, 36
"Continued" tables . . . 36, 37
Headnotes . . . 34, 35, 36
Kinds of . . . 34
Location . . . 32, 35, 36, 37
Footnotes . . . 35, 36, 37
General . . . 35, 99
Reference symbols . . . 35-36
Sequence . . . 36
Special . . . 35
Source . . . 35
Notes in charts (see also Notes tabular and Footnotes in text):
General notes . . . 99
Reference notes . . . 99
Source notes . . . 99
Numbers:
Line . . . 28, 31
Numbers, page . . . 111, 112, 119, 121
Numbers, table, in titles . . . 22
Numbers in text:
Other rules . . . 6-7
Rounding . . . 7
Simplifying . . . 7
What to show in numerals . . . 6
What to show in words . . . 6
Numerals, Roman, for tables . . . 22

O

Page

One hundred percent bar chart 55
One hundred percent surface chart 51
Order of items in:
  Bar charts 54
  Stubs 22-28
Outline report 117

P

Page:
  Broadside 13, 114-115
  Elements 110
  Fold-in 15, 42, 115
  Format 110
  Number 111, 112, 113
  Reduction 42, 111, 112, 118, 119, 120
  Size 109-110, 111, 112, 119
  Specifications 111, 112
Paints 133
Paired bar chart 55
Paragraphs:
  Carryover to next column 8
  Indention 8
  Numbering 8
  Rules for 8
Pens, lettering 102, 104-107
Percentages 21
Percent sign 34
Perspective charts 63-64
Perspective plus 3-dimensional treatment in charts 64
Photo offset 120
Pictographs 64
"Pictorial" chart style 76-77
Pictorial symbols 64
Pie charts 62
Plotting charts 82
Pointers, label 93, 98, 100-101
Pointing 134
Poor presentation, typical examples of 65
"Poster" chart style 76, 77
Posters, big original and blowups 127, 130-134
Precharting technique 120
Prepared materials 42, 98
Preprinted forms 42-43
Preprinted parts in chart construction 98
Printed publications, chart style for 76
Preface 108, 109, 110
Presentation:
  Equipment 134
  Good quality 1
  Major problems 2-4
  Oral, hints 134
  Procedures (eight basic steps) 2-4
  Three forms (text, tables and charts) 4
Production hints:
  Oral presentations 134
  Poster displays 130
  Projection displays 127, 128-129
  Schedule 117
  Techniques 117
Program, objective, performance, plan, requirement 58, 59, 92, 93
Progress chart 61, 92, 93
Progressive or step-by-step bar charts 57
Projection:
  Methods 127
  Opaque 127, 129
  Overhead 127, 128-129
  Slide 127, 128
  Transparent 127, 128-129
Projections and goals, how to indicate 92-93
Projectors 127, 128, 129
Proofreaders' marks 123, 124
Proofreading 122-125
Punctuation:
  Boxhead 29
  Footnotes 8
  Importance of 5
  Rules for 5, 6
  Stub 28

Q

Quality control 59

R

Range-bar chart 57
Range chart. (See Band chart, Change-bar chart, Column, slope-curve and Range chart.)
Range-column chart 53
Rank chart 61
Rates 21
Ratios 21
Reduction, page: 42, 111, 112, 118, 119, 120

Page

Reduction, page - Continued
  Page numbers 113
  Running heads 113
Reference:
  Material 108
  Notes 32, 99
  Numbers and letters 32, 35-36
  Symbols 7-8, 35-36
  Tables 12
Repeated time scale charts 48
Report checking 11, 121, 125
Reproduction, two-sids and one-side 110
Review and analysis, detailed, in a large report 108
Rounding figures 7
Rulings, for charts 84-87
Rulings, tabular:
  Blue pencil 38
  Helping the draftsman 38
  Other ruling considerations 38
  Text 8
  Weight of rulings 38
  Where to put rulings 38
Runaround, text 114
Running head 110, 111, 112, 113, 118, 119

S

Scale rulings 84-87
Scales:
  Amount-scale captions 82
  Amount-scale intervals 81
  Amount-scale range 80
  Breaking the amount scale 50, 65, 80, 81
  Breaking curves 81
  For bar charts 88-89
  For frequency charts 83
  For time-series charts 80-87
  Location of amount scales 82, 84-85, 88
  Location of time scales 83, 84, 86-87
  Time-scale captions 83, 86, 87
  Time-scale divisions 82, 83
  Time-scale range 82
  Uniform scales 81
Screen:
  Distance 129, 131
  Image 129
  Size 129, 131
Security:
  Labels 110, 111, 112, 113
  Page 108
Shading, selection and use of 94, 95, 96, 132-133
Signs and symbols: 6
  Asterisk 32
  Footnotes 32
  Minus 32
  Plus 32
  Reference symbols 35-37
Simple bar chart 54
Simple column chart 52
Simple curve chart 46
Simple frequency chart 60
Simple slope-curve chart 46
Simple slope-surface chart 50
Simple step-curve chart 46
Simple step-surface chart 50
Simplifying figures 7
Size of report 109-110, 111, 112, 119
Sketches 70, 117
Sliding bar chart 56
Slope and step-curve chart 58
Slope-curve charts 46, 47
Slope-surface charts 50
Source notes 35, 99
Spacing:
  Between report elements 114
  Boxhead 29
  Paragraphs 8
  Problems in tables 39-42
  Single or double column 8
  Spacing bars (or columns) 90, 91
  Spacing letters, words, and lines on charts . . . 103, 105-107
  Stub 24, 26, 27
  Table width and length 39-42
  Words and letters for display 130
Spanners, field 14, 17, 18, 19, 29, 31, 33
Special purpose tables 12
Specification, chart construction 105, 106, 107
Split-scale chart 59, 84, 87
Standard sizes of charts 79
"Statistical" chart style 76-77
Status chart 61
Status-change-status charts 74
Step-by-step bar chart 57
Step-curve charts 46
Step-surface charts 50, 51

Page

Strata chart 50
Stub:
Arrangement of items in spacing 22, 24, 25, 26, 27
Capital letters 24
Double designing 22, 24
Heading 22
Indention 24
Leaders 28
Lengthening 26
Line numbers 28
Major items 24
Organizing 22, 23
Punctuation 28
Shortening 27
Spacing, normal 24, 26, 27
Spacing, vertical 24
Subordinate items 24
Totals, placement 24, 28
Underlines 28
Wording 28
Style (see also Chart style) 76-77
Style, mechanics of:
Abbreviations 6
Numbers in text 6
Punctuation 5
References 5
Word Division 5, 10
Subdivided bar chart 54
Subdivided column chart 52
Subdivided slope-surface chart 50
Subdivided step-surface chart 51
Subdivided surface charts (see also Surface charts):
Arrangement of "irregular" components 73
Improper use of 73
Subdivided surface and curve chart 58
Subtables 18, 19
Subtitles, chart 99
Summary:
Section of a report 108
Tables 12
Text 5
Supplementary amount-scale chart 49
Surface charts:
Arranging irregular layers in subdivided surface charts . . 73
Band chart 51, 73, 105
Broken scales never used 50
Deviation-curve chart 51
Differ from an area chart 50
Grid proportions 78
Improper use of subdivided surface charts 73
Lettering sizes to use 102, 105
Line weight standards 102, 104
One hundred percent surface chart 51
Simple slope-surface chart 50
Simple step-surface chart 50
Simple surface chart 50
Spacing between lines 103
Specification sheet 105
Subdivided slope-surface chart 50
Subdivided step-surface chart 51
Surface and curve chart 58
Symbols, graphic 71
Symbols, pictorial 64
Symbols, "square dial" 61
Symbols, tabular 32, 34-36

T

Table:
Boxhead 28-31
Broadside 13, 114-115
Components of 19-22
Double-page spread 15
Field 31-34
Formal 12
General purpose 12
Informal 29
Multipage 15, 22
Numbers in titles 22
Odd shape 40-41
Oversized 40
Production 11
Position on page 11
Single page 15
Special purpose 12
Structure 15-19
Stub (see also Stub, table) 22-28
Tabular notes 34
Tabular rulings 38
Text 12
Title (see also Title, table) 20-22
Width and length 13, 15, 39-42
Tables, types of:
Single stub and single boxhead 15, 16
Divided stub and repeated boxhead 15, 16

Page

Tables, types of - Continued
Repeated stub and divided boxhead 17, 19
Repeated stub and single boxhead 17, 19
Repeated stub and repeated boxhead 18, 19
Subtables 19
With field spanners 17, 18
Tables, advantages and disadvantages of 4, 11
Tables, oversized 40-42, 120
Tabular:
Notes 34
Rulings 38
Tapes, adhesive 134
Tapes, double adhesive 131
Terms used:
In graphic presentation 45, 105-107
In tabular presentation 14
Text:
Advantages and disadvantages of 4, 5
Arrangement 7, 114
Purposes 5
Tabulations of text tables 12
Three-dimensional charts 63, 64, 76, 77
Three-dimensional plus perspective treatment, in charts . . . 64
Time scale:
Captions (see also Captions) 82-83, 86-87
Divisions 82
Range 82
Standard location of 83
Time-scale designations and rulings (see also Scale rulings):
Annual data 87
Calendar year data 86
Fiscal year data 86
Quarterly data 87
Split-scale charts 87
Title:
Page 108, 109
Report 109
Title, table:
Capitalization 21
Double-page spread 15
Dates in titles 20
Emphasis in titles 20
Multipage tables 15, 22
Percentages, rates and ratios in titles 21
Placement and capitalization of titles 21
Punctuation in titles 21
Single page 15
Subtitles 20
Table numbers in titles 22
Titles for multipage tables 22
Wording of titles 20
Titles, chart:
Abbreviations in 99
Length 99
Letter count per line 102
Location 99
Totals:
Computer printed 43
In stub 24, 28
Location 25-28, 30
Transparencies, projection 127, 128-129
Trim size 111, 112
Two-way progressive bar chart (see also Progressive or step-by-step bar chart) 57
Type (see also Chart, lettering):
Face and size specification 110-113
Faces, display 130
Faces, text 110, 113
Page 110, 111, 112, 119
Sizes for display 131
Typing:
Area 110, 111, 112, 119
Layout sheet 111, 112, 117, 118, 119, 120

U

Underscore and underline (see also Ruling):
In stub 24, 25-28
In text 8

W

Width:
Broadside pages 13, 114, 115
Double-page spread 13, 15, 22, 114
Fold-in pages 15, 42, 115
Half-page and full-page tables 114
Narrow pages 114
Word division 5, 10

Z

Zero 32, 34
Zero line, omission of 54, 80

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army: To be distributed in accordance with DA Form 12-9 requirements for Administration - E.

NG: None.

USAR: None.

U. S. GOVERNMENT PRINTING OFFICE : 1966 O - 214-853